प्रगति प्रतिवेदन
PROGRESS REPORT
2019-20

जौ सुधार
BARLEY IMPROVEMENT

अखिल भारतीय समन्वित गेहूँ एवं जौ अनुसंधान परियोजना
AICRP on Wheat and Barley

भा.कृ.अनु.प.–भारतीय गेहूँ एवं जौ अनुसंधान संस्थान, करनाल

ICAR-Indian Institute of Wheat and Barley Research, Karnal

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All India Coordinated Research Project on Wheat and Barley

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59th All India Wheat and Barley Workers Meet (24-25 August 2020)
RESEARCH HIGHLIGHTS OF BARLEY IMPROVEMENT

The crop season 2019-20 was not a very good for barley production as the crop experienced nearly 2% increase in production over the previous year, despite an increase of in area by 7% over the previous year as the productivity came down by 9.3% from 28.37 to 25.73 q/ha. According to 3rd advance estimates for Rabi 2019-20, nearly 1590 thousand tons of barley has been produced in 618.4 thousand ha area with a productivity of 25.73 q/ha. In India, Rajasthan is the largest state having >52% in production and 46% area followed by Uttar Pradesh. In case of Madhya Pradesh, a major shift has been noticed for decline in in area from 121 thousand ha to 30 thousand ha which is around 75% reduction, while in Rajasthan there is an increase of 28% in area from 225 thousand ha to 288 thousand ha. While Punjab and Haryana have indicated downward trends, Maharashtra has an increasing trend for barley in recent last two years. In other states only minor fluctuations are there for barley area/ production.

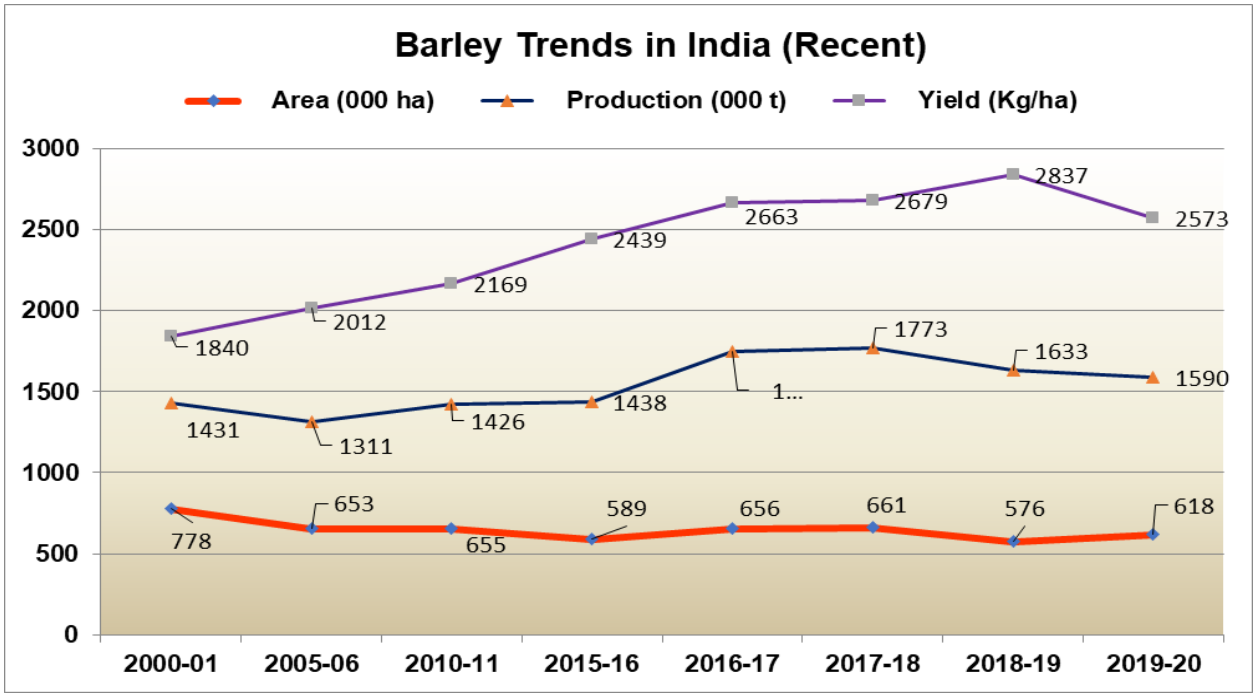
Estimates of barley area, production and productivity in major barley growing states

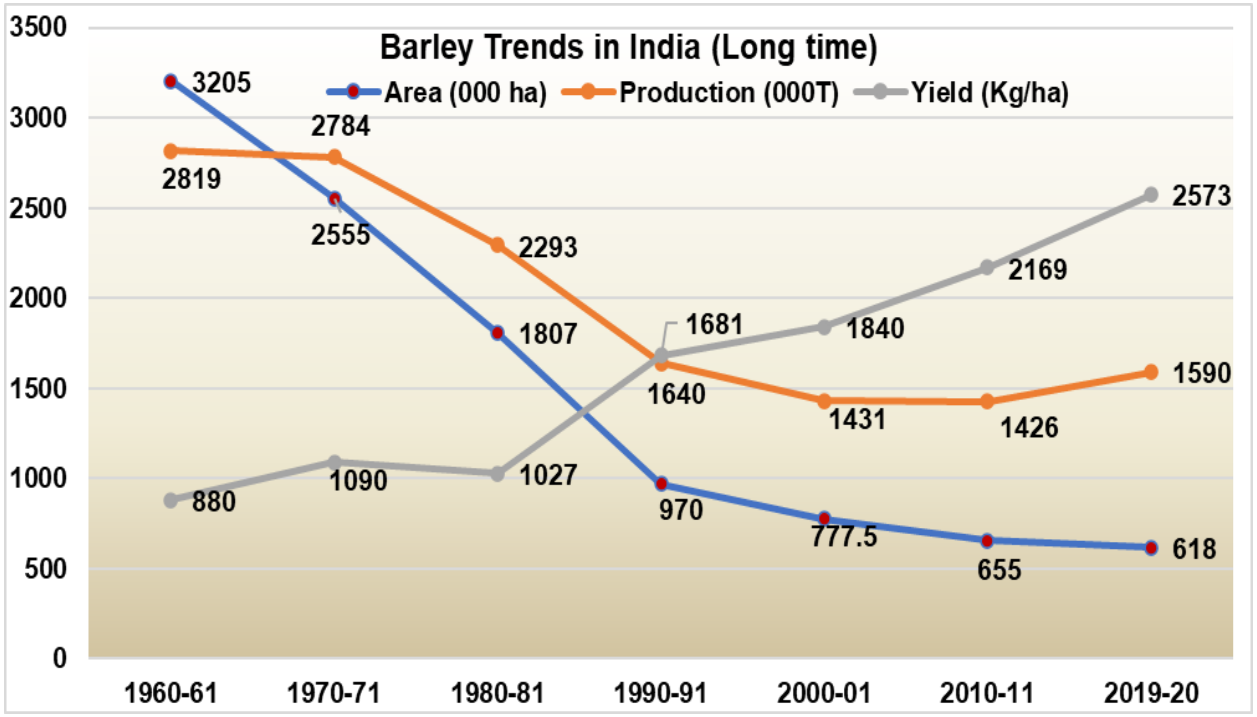
State	Area (000 ha)			Production (000 T)			Yield (q/ ha)		
	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20*	2017-18	2018-19	2019-20
Rajasthan	274.0	225.9	288.2	876.3	812.0	831.2	31.98	35.97	28.84
U. P.	144.0	151.0	164	403.0	455.4	484	27.98	30.16	29.56
M.P.	130.0	83.0	30.0	297.6	164.0	52.1	22.89	19.81	17.35
Haryana	20.0	14.9	12.2	69.0	57.6	44.0	34.50	38.66	36.40
Punjab	7.5	6.8	9.0	28.4	25.5	33.9	37.86	37.47	37.63
Bihar	10.6	14.3	15.2	16.0	28.4	25.8	15.05	19.90	16.94
H.P.	19.5	20.4	20.4	29.6	36.0	36.0	15.20	17.70	17.70
Uttarakhand	20.0	23.0	24.0	256.0	32.8	34.4	12.50	14.24	14.32
Maharashtra	-	25.4	43.0	-	11.8	39.6	-	4.65	9.22
J&K	6.6	6.4	NR	4.0	4.21	NR	6.57	6.55	NR
West Bengal	2.8	0.7	0.8	3.9	0.70	1.2	14.28	15.17	15.00
Others	1.05	8.4	9.9	1.5	6.2	6.6	14.27	7.30	6.72
All India	661.7	575.6	618.4	1772.9	1633.0	1590	26.79	28.37	25.73

**3rd advance estimates for 2019-20*

In recent years a concern is usually raised at various platforms for barley area decline under barley in India, however, in last 20 years, the area has more or less stabilized and there has been gain in productivity resulting in higher production as demonstrated in the following figures. The possible reasons for the non-preference by farmers for barley could be the lack of profit or difficulties in selling the produce as per convenience. Though the MSP of barley (Rs.1440/-) is much lower than wheat (Rs.1840/-), but during current season the market price of barley remained higher (>Rs 1600/q). Secondly, despite declaring the MSP there is no procurement by government agencies, which makes it non assured procurement crop and farmers are not willing to take such risk except in cases where there is no better options are available or industry is taking care of procurement either through premium price for malt barley or market people based in important mandis.

A few of such industries had also followed "contract farming" with malt type varieties to ensure regular supply of the raw material for their units. This has given much needed impetuous to the barley cultivation under better managed conditions and we can expect further rise in productivity. Thus, there is a need of support in terms of assured procurement and higher MSP for barley from government side also to support its production. Also, the import duty on barley is required to support indigenous production and procurement for good quality malting barley varieties, which are available but need breeder seed indenting by the different states, private and public sector agencies, to assure the availability of quality seed for farmers. Many a times an unplanned sudden demand comes from industry for huge seed quantity, which cannot be met because of non-prior indenting.





During the year more damage/losses in quantity and quality of the grain due to severe lodging was observed as compared to normal season in different areas in timely sown crop. The monitoring teams during the surveys in the major barley growing areas during the season observed that the crop season was by and large a disease-free year in major barley growing areas, with some incidence of aphids in the plains and yellow rust in foothills and mid hills. The incidence of leaf blights was observed in the eastern zone. The smuts were common in fields where the seed was not treated by farmers.

Release and Identification of new barley variety

Three barley varieties namely DWRB160 (Karan Maltsona), PL891, and Him Palam Jau 1 (HBL713) were released and notified by CVRC/SVRC, for commercial cultivation during 2019. Out of these, PL891 is the two-row huskless barley with bold grains for food purposes, released in NWP Zone

after a gap of more than 34 years, with overcoming the major problem of small grain size of six-row huskless varieties.

Barley varieties released and notified by CVRC/SVRC during 201-20.

SN	Variety	Parentage	Zone	Developed at	Production condition	Av. yield	Pot. yield
1.	PL891	IBON343/ 12thHBSN176	NWPZ	PAU, Ludhiana	Huskless barley, Irrigated timely sown,	36.6	50.0
2.	DWRB160 (Karan maltsona)	DWRB62/ DWRB73	NWPZ	ICAR-IIWBR, Karnal	Irrigated timely sown, Malt barley	53.7	74.1
3.	HBL 713 (Him Palam Jau 1)	HBL276/ HBL364	Low & Mid hills of HP	CSKHPKVV, Bajaura	Timely sown rainfed in Hills	33.6	51.3

Registration of genetic stocks

Seven genetic stocks namely DWRB191, DWRB192, IC113045, IC113052, EC667420, IC492301 and IC0542197 were registered with ICAR-NBPGR for their unique traits during the year, including two for nutritional quality traits like Zn (DWRB191) and Fe (DWRB192) contents for the first time in country.

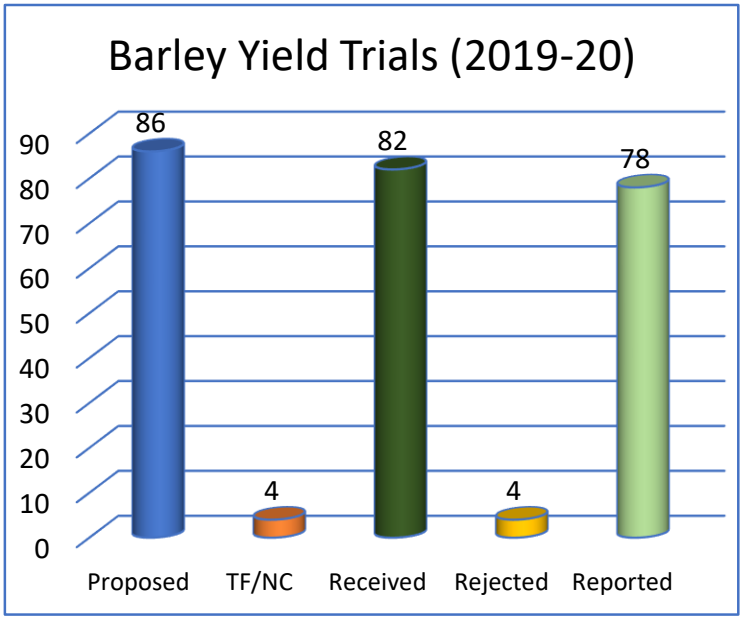
Genetic stocks registered with NBPGR New Delhi during 2019-20

SN	Genetic stock	INGR No.	Year	Institute	Trait
1.	DWRB191	19012	2019	ICAR-IIWBR, Karnal	High grain zinc content
2.	DWRB192	19013	2019	ICAR-IIWBR, Karnal	High grain iron content
3.	IC113045	19055	2019	ICAR-NPBGR, New Delhi	Extra dwarf plant stature along with early maturity in six-rowed hulled in genetic back ground
4.	IC113052	19056	2019	ICAR-NPBGR, New Delhi	Long spikes coupled with more no. of grains/ spike in two rowed & hulless genetic background
5.	EC667420	19057	2019	ICAR-NPBGR, New Delhi	Early maturing hooded barley in six-rowed and hulled genetic back ground
6.	EC492301	19058	2019	ICAR-NPBGR, New Delhi	Awnless spikes
7.	IC0542197	19059	2019	ICAR-NPBGR, New Delhi	Early maturing in two-rowed and huskless genetic background

CROP IMPROVEMENT

Coordinated Yield Evaluation Trials

- Out of 86 yield evaluation trials proposed 84 trials were conducted. Two trials were failed at Mathura. The data were received in time for 82 trials. After the analysis, only 78 trials (91% of proposed, 95 % of conducted) were found good for reporting.
- These trials were conducted at 11 main centres and 30 additional testing centres (including ICAR, SAUs and State Department of Agriculture) during Rabi 2019-20.
- In all 97 test entries contributed by 12 centres, were evaluated against 24 checks in the coordinated yield trials under rainfed (plains and hills), Irrigated (plains) and saline soils



conditions. One entry was also contributed by private industry M/s AB InBev India Ltd. Bengaluru. The new barley entries include malt, feed or dual purposes types and mostly were hulled type with a few hull-less types in northern hills and plains.

Promising entries in AVT/IVTs during 2019-20

Based upon the promotion criteria i.e. significantly superior or better than check with additional trait(s), monitoring reports for purity, disease/pest reactions and the quality (as applicable), 11 entries namely; BH1029, HUB272, KB1822, PL911, PL917 KB1822, RD3012, RD3013, RD3016, UPB1086, and UPB1088 were found suitable for the promotion into advanced varietal evaluation in different trials.

Promising entries in different trials during 2019-20

SN	Trial name	Zone	Entry
1	AVT-SST	NWPZ/NEPZ	RD3016
2	AVT/IVT- HLS	NWPZ/NEPZ/ CZ	UPB1086
3	IVT-FB	NWPZ	HUB272
4	IVT-FB	NEPZ	KB1822, RD3012, HUB272, BH1029, PL911 and PL917
5	IVT-FB	CZ	KB1822, RD3013 and UPB1088

**Based on quality parameters*

AVT-MB-TS:

- The trial was proposed at 9 centres data of 8 locations were considered for zonal compilation after statistical analysis.
- The trial comprised of four test entries viz., DWRB182,DWRB196, DWRB197 and PL908 and five check varieties, where entry DWRB182 was in final year of testing.
- The zonal mean grain yield was exhibited as 50.20 q/ha and ranged from 35.9 q/ha (Ludhiana) to 65.5 q/ha (Durgapura).
- Amongst the genotypes, entry DWRB196 ranked first with 53.3 q/ha mean grain yield followed by the best check variety DWRB123 (53.0 q/ha) in the first non-significant group.

AVT-IR-FB-NEPZ:

- The AVT feed barley was proposed at 8 locations comprising in NWPZ and was conducted at all locations. The results from all the eight locations were included for zonal compilation after statistical analysis.
- The trial consisted of four entries and four checks, namely BH946, RD 2552, BH902 and DWRB137.
- The zonal mean grain yield was exhibited as 48.60 q/ha and varied from 34.4 q/ha (Karnal) to 68.2 q/ha (Tabiji).
- The check BH946 ranked first with 49.6 q/ha mean grain yield followed by the remaining seven entries/checks, UPB1080 (49.3 q/ha), PL906 (48.7 q/ha), RD2552 (48.6 q/ha), RD2994 (48.4 q/ha), KB1707 (48.4 q/ha), BH902 (47.8 q/ha) and DWRB137 (47.7 q/ha) in the first non-significant group.

AVT-SST:

- The trial was proposed at seven centres and data of five locations were included for zonal compilation after statistical analysis, as trial at Banasthali was not conducted and data from Rampura were rejected.
- The trial consisted of 18 genotypes including 14 test entries and four (RD2552, NDB1173, RD2794 and RD2907) check varieties.
- The zonal mean grain yield was 27.5 q/ha and ranged from 19.4 q/ha (Faizabad) to 31.6 q/ha (HAU Hisar). Amongst the genotypes, only entry RD3016 (32.8 q/ha) was in 1st non-significant group. Another entry KB1822 (30.4 q/ha) ranked second in the trial. However, both entries were found significantly superior to the best check RD2794 (28.5 q/ha).

IVT-MB-TS:

- The trial was proposed at 10 centres data from 9 locations only were considered for zonal compilation after statistical analysis. The trial comprised of 17 test entries and five check varieties.
- The trial mean grain yield was observed as 57.80 q/ha, which ranged from 40.6 q/ha (Hisar) to 76.7 q/ha (Sriganganagar) suggesting varied genotypic performances across the locations. Amongst the

genotypes, the entry UPB1090 ranked first with 63.1 q/ha followed by the entry UPB1089 (62.4 q/ha), check variety DWRB160 (62.1q/ha) and the entry RD3026 (61.5 q/ha) in the first non-significant group.

IVT-FB-NWPZ/NEPZ/CZ:

- The IVT feed barley was proposed at 18 locations comprising of NWPZ (7), NEPZ (7) and Central Zone (4) in northern plains. The trial was conducted at all locations. The results from all the seven locations were included for zonal compilation in NWPZ. In case of NEPZ, six locations were included in zonal means as the data from Kalyani (low yield levels) were rejected. Similarly, in central zone data were reported from all the four centres.
- The trial consisted of 20 entries and five checks, namely BH946, RD2552, DWRB137, RD2899 and BH902.
- In case of grain yield, in NWPZ, check DWRB137 ranked first with 55.0 q/ha mean grain yield followed by entry HUB272 (54.9 q/ha) in the first non-significant group. In NEPZ, check RD2899 (45.7 q/ha) ranked first and was followed by RD3011 (45.4 q/ha), BH946 (44.3 q/ha) and KB1822 (43.6 q/ha) respectively, in the first NSG.
- In case of central zone check the entry UPB1088 (55.2 q/ha) ranked first and was followed by nine more entries in the first non-significant group. On national basis check DWRB137 (50.0 q/ha) ranked first followed by check RD2899 (49.9 q/ha) and entry RD3011 (48.3 q/ha) in first Non-Significant Group.

AVT /IVT-Hulless-NWPZ/NEPZ/CZ:

- In AVT/IVT hulless barley was proposed at 14 locations comprising of NWPZ (6), NEPZ (3) and Central Zone (5) in northern plains. The trial was conducted at all locations. The results from all the locations were included for zonal compilation in all the three zones (NWPZ, NEPZ and CZ).
- In case of grain yield, in NWPZ, entry DWRB204 ranked first with 38.9 q/ha mean grain yield followed by UPB1086 (38.9 q/ha) and check Karan16 (38.1 q/ha) in the first non-significant group. In NEPZ, UPB1086 (46.7 q/ha) ranked first and was followed by check Karan16 (39.9 q/ha) in the first NSG. In case of Central Zone entry UPB1086 (46.8 q/ha) ranked first and was followed by check Karan16 (46.5 q/ha) in the first Non-Significant Group.

IVT-RF-NEPZ:

- The trial was proposed at 8 centres in NEPZ and data from all the locations were considered for zonal compilation after statistical analysis. The trial comprised of 13 test entries and 2 checks viz. K603 and Lakhan.
- The trial mean grain yield was 29.3 q/ha which ranged from 20.7 q/ha (Sabour) to 40.9 q/ha (Kanpur). The check variety Lakhan ranked first with a mean grain yield of 33.9 q/ha followed by entries DWRB213 (33.9q/ha), KB1832 (33.6 q/ha) and KB1830 (33.3 q/ha) in the first non-significant group.

AVT-RF-NHZ:

- The IVT/AVT rainfed was proposed at 11 locations and the trial could not be conducted at Khudwani. The results from ten locations were received and nine locations were included for zonal compilation as data from Ranichauri location were not considered (low yield levels) for zonal pooling.
- The trial mean grain yield was 32.0 q/ha which ranged from 15.05 q/ha (Shimla) to 39.54 q/ha (Majhera). In case of entries, check BHS400 ranked first with 36.5 q/ha mean grain yield followed by entries BHS482 (36.4 q/ha) and BHS481 (36.3 q/ha) in the 1st Non-Significant Group.

Breeder seed production

An indent of 524.97q breeder seed of 26 varieties was received from DAC&FW, Ministry of Agriculture & Farmers Welfare, Govt. of India. The indent included the requirement of eight states (Punjab, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh and Uttarakhand) and three public sector agencies (National Seeds Corporation, IFFDC & HIL,) and one private agency (National Seed Association of India) for the season Rabi 2019-20.

The highest indent was placed by Rajasthan (220.01q) followed by Uttar Pradesh (120.0q) and National Seed Corporation (56.0q). From variety point of view, the highest indenting varieties were for the variety RD 2786 (126.00q) followed by RD2794 (103.05q) and DWRUB 137 (69.97q). A total 526.97q breeder seed indent of 28 varieties was allocated among 12 BSP centres. A total of 997.25q breeder seed

of 28 varieties was produced by 12 BSP centres during 2019-20 which is significantly surplus (+470.28q) over the total allocated quantity (526.97) of breeder seed.

Germplasm Evaluation & Exchange

In order to facilitate the availability of promising new diversity in the national barley program, the All India Coordinated Wheat and Barley Improvement Program (AICWBIP) organizes the import and conduct of international trials and nurseries in country. During Rabi 2019-20, two international yield trials and two observation nurseries were supplied from ICARDA which included a total of 390 genotypes for different production conditions. One set each of these nurseries and trials was also evaluated at ICAR-IIWBR, Karnal. Rest of the sets were evaluated at different locations as per the requirements. Due to Coivid-19 pandemic the *Field Day*, which is organized every year to give opportunity to barley breeders of NARS to select material from these nurseries as to cater their local needs, could not be organized.

International trials and nurseries evaluated during crop season 2019-20

SN	Trial/Nursery	Entries	National Check	# Sets	Locations
1	IBYT-HI-2020	24	BH946	4	Durgapura, Hisar, Ludhiana, Karnal
2	7th GSBYT-2020	24	K603	4	Hisar, Pantnagar, Kanpur, Karnal
3	IBON-HI-2020	160	BH946	4	Durgapura, Pantnagar, Ludhiana, Karnal
4	7thGSBON-2020	180	Lakhan	4	Kanpur, Faizabad, Bajaura, Karnal

In addition, one set each of EIBGN with 45 entries selected from ICARDA trials/ nurseries of 2018-19 crop season and six released varieties (BH946, BH959, BHS400, RD2715, DWRB101 and DWRB137) was each supplied to 10 barley breeding centres across NWPZ (Karnal, Hisar, Durgapura, Ludhiana, Pantnagar), NEPZ (Kanpur, Faizabad, Varanasi) and NHZ (Shimla, Bajaura) for further evaluation and utilization. Several EIBGN entries were found better than checks at different locations in three zones. The highest grain yield across the zones was registered by 6thGSBON-2018-19-34 (32.6 q/ha) followed by IBON-HI-2018-19-119, 6thGSBON-2018-19-32, 6th GSBON-2018-19-86, 6thGSBON-2018-19-47 and 6thGSBON-2018-19-27 in the first NSG. Entry 6thGSBON-2018-19-34 was found to be superior for grain yield in all the three zones (NWPZ, NEPZ and NHZ).

A National Barley Genetic Stock Nursery (NBGSN), was constituted during the year consisting of 15 entries as promising sources for important traits from AICW&BIP trials/ nurseries during 2018-19 crop season. The NBGSN was supplied as suggested crossing block for evaluation and utilization at 10-centres (Durgapura, Ludhiana, Karnal, Hisar, Faizabad, Varanasi, Pantnagar, Kanpur, Shimla and Bajaura). Though the precise utilization reports for these genotypes by individual centers/ breeders during the crop season have not been received, while some centers indicated the utilization in hybridization. Bajaura center has utilized NBGSN entries HBL 814, HBL 812, BBM 797, BBM 814 and VB 1826 in the crossing programme, while Shimla centre will use after one year of local evaluation. Similarly, Durgapura centre has used 10 genotypes in the crossing program.

During year 2019-20, 500 barley accessions from the DWR active collection were rejuvenated as a regular maintenance activity of germplasm conservation.

Zonal Monitoring

The teams constituted for monitoring of Barley Yield Trials & Nurseries in Central zone, NWP and NEP Zone, visited different locations at the most appropriate stage of the crop and recorded observations about the varietal performance, conduct of trials, disease/ pest incidence and genetic purity of the test entries. The team in NHZ conducted the virtual monitoring due to Coivid-19 pandemic related restrictions. On the spot decisions were taken about the rejection of trials and purity of test entries. The proceedings of these team meetings have been circulated for necessary action by concerned breeders and other scientists and copies of the same is appended in the report for record.

Zonal monitoring visits of the barley teams

Zone	Date	Centres visited
CZ	13-14 Feb. & 03-05 Mar, 2020	Udaipur, Vijapur, Morena, Gwalior, Jhansi and Tikamgarh
NEPZ	23-24 Feb., 2020	Kanpur, Dalipnagar, Faizabad, Varanasi, Saini, Kalyani, Sabour, RAU Pusa, Ranchi and Chiyanki
NWPZ	03-07 March 2020	Bawal, Durgapura, Tabiji, Fatehpur, Hisar, Bhatinda, Ludhiana, Agra and Mathura

CROP PROTECTION

Survey and surveillance for diseases and pests

There was negligible incidence of barley rusts in India during 2019-20. Few sporadic incidents of barley stripe rust were reported from Northern India only. The field surveys were conducted by different scientist of cooperative centers, during the survey yellow rust was observed from TS-10S at Kotputli and Dausa district of Rajasthan. Stem and leaf rusts of barley were practically not reported from the farmer's fields. The field surveys by different scientists of cooperative centers recorded loose smut, covered smut and bacterial leaf streak in traces in some fields. Loose and covered smuts were noted in traces to 3 percent in most of the area surveyed. *Drechslera* leaf stripe and bacterial streak were also noted in traces in some fields. Overall barley crop was healthy in all the barley growing areas in India.

The survey conducted during the 2019-20, to determine the incidence of insect-pests and their natural enemies on barley crop indicated aphid as the main insect pest and its population was found to be moderate to high in barley fields at all the locations. Among natural enemies, coccinellid beetles, chrysoperla and syrphid fly were frequently noticed predating on barley aphids.

Pathotypes distribution and seedling resistance tests

The pathotypes distribution and seedling resistance tests (SRT) of barley rusts indicated that in stripe rust of barley (*P. striiformis hordei*), 10 samples were analyzed from Himachal Pradesh, Rajasthan and Nepal. Pathotypes 0S0(57) and 4S0(G) were most predominant whereas 1S0(M) was recorded in one sample only. The NBDSN (116 entries) and EBDSN (44 entries) were screened for SRT against the different pathotypes (Pts) of three rusts of barley under precise conditions of temperature and light at ICAR-IIWBR RS Shimla. The SRT against seven Pts of *P. striiformis hordei*, five Pts of *P. graminis tritici*, and 4 pts as well as mixture of pts. of *P. hordei* was completed. None of the NBDSN and EBDSN entries was resistant to all the tested pathotypes of yellow, brown and black rusts. In case of NBDSN, 12 lines were found as resistant to leaf and stripe rusts; one line was resistant to stem and stripe rusts and four as resistant to leaf and stem rusts. Individually, 16 lines were resistant to stripe, 2 to stem and 22 to leaf rust only. In case of EBDSN, nine lines were resistant to leaf and stripe rusts, one to stem and stripe rusts and two to leaf and stem rusts. Resistance to individual rust was observed in 19 lines, 10 lines showed resistance to stripe, one to stem and 8 to leaf rust only.

Field screening for diseases and pests

In case of field screening for diseases and pests the significant findings are as below:

- Total 577 entries were screened under various nurseries (IBDSN, NBDSN and EBDSN) for resistance against various diseases, aphid and CCN at different cooperating centers during the crop season 2019-20.
- Among 404 entries evaluated in IBDSN during 2019-20, only 2 entries were found free from yellow rust (ACI = 0) and 163 entries showed resistant reaction having ACI less than 10. In case of leaf blight screening, 35 entries were found moderately resistant against leaf blight with an average score (double digit) 14-35 and HS < 57.
- Out of 116 entries evaluated in NBDSN during 2019-20, 58 entries showed resistant reaction having ACI less than 10. In case of leaf blight screening, only RD3017 found moderately resistant with an average score (double digit) 14-35 but HS was higher than 57 because of high disease at one location.

- Under the EBDSN 44 entries screened, no entry found free from yellow rust, whereas 38 shown resistant reaction. The 6 entries also showed moderate level of resistance against leaf blight with an average score (double digit) 14-35 and HS < 57 but the HS was more due to one location.
- Among these treatments spraying of Tebuconazole 50% + Trifloxystrobin 25% WG @ of 0.06% was found most effective in management of yellow rust.
- A total of 116 barley NBDSN entries (including checks and infector) were screened against foliar aphid at three locations (Ludhiana, Kanpur, Karnal) during 2019-20. The entries were found to be in the category grades i.e. 2 to 5. Six entries viz., BH1028, HBL867, PL908, PL912, RD3022 and Lakhan (C) were found to be resistant (grade 2) at Kanpur. At Ludhiana centre, three entries viz., PL906, HBL113(C) and RD2899(C) were found to be moderately resistant (grade 3), however in Karnal entry PL912 was rated as moderately resistant (3). Overall based on the average score of three locations, five entries BH1028, HBL867, PL908, PL912 & RD3022 fall under moderately resistant category (grade 3).
- A total of eight treatments were tested for their efficacy against foliar aphid in barley. Treatment of Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon)@ 400 ml/ha was found the best treatment followed by Sulfoxaflor 12 % SC @250 ml/ha in managing aphid population in barley.
- A total 116 entries of NBDSN and 44 of EBDSN, were screened against the Cereal Cyst Nematode (CCN) at three locations viz. Durgapura, Ludhiana and Hisar. None of the entries was observed as resistant or moderately resistant and all entries fall in the category of susceptible or highly susceptible.

RESOURCE MANAGEMENT

The resource management group conducted experiments for varietal evaluation in AVT and for updating the package of practices of barley crop in different zones. A total of 31 trials were proposed and conducted at different locations and 30 were reported, data of one trial at Karnal could not be included in pooled analysis because differential irrigation treatment could not be imposed in the trial due to frequent rains in the season. The significant findings are as follows:

- The genotypes responded up to 90 kg Nitrogen/ha in the V x N levels trial of AVT malt barley entries. The test entry DWRB 182 (45.26 q ha^{-1}) yielded between 4.25-5.51% less as compared to the recently released two row and six row checks.
- In NHZ, conventional tillage (33.51 q/ha) and zero tillage + residue (32.08 q/ha) were at par and superior to zero tillage alone. BHS 400 registered significantly higher grain yield (43.43 qha^{-1}) compared to all other varieties, followed by VL 118 (37.24q/ha) under conventional tillage.
- The irrigation management trial in NWPZ, two irrigations (one at 30DAS and other at 60-65 DAS) was found sufficient to produce optimum grain yield. Three and two irrigation levels were at par. Six-row variety BH 946 and two-row variety DWRB160 were at par. In NEPZ, the genotypes responded up to three irrigation level. The yield was 29.09, 35.62, 39.52 and 42.56 q/ha with zero, one, two and three irrigations, respectively. The variety DWRB137 was superior to HUB113 at all irrigation level. In CZ, the yield increase was up to two irrigation level in DWRB137 and up to three irrigation level in RD2899. On an average, the yield increased significantly up to three irrigations.
- Hydrogel with irrigation was evaluated in dry areas of NWPZ and resulted that application of Pusa Hydrogel @2.5 kg ha-1 and New Hydrogel @2.5 kg ha-1 were significantly better as compared to no hydrogel conditions and both the hydrogels were at par at all irrigation level. The hydrogel with two irrigations and no hydrogel with three irrigation were at par and one irrigation water can be saved with hydrogel use.
- In NHZ, application of FYM@5t/ha + NPK @30:40:30 kg/ha resulted a significantly higher grain yield as compared to application of FYM alone @ 10 t ha-1 or NPK @60:30:40 kg ha-1.
- Soil application with Zn sulphate @25 kg/ha was found superior as compared to all soil and foliar application in NWPZ with 14.6% yield advantage over no Zinc application. In NEPZ and CZ, soil application with Zinc sulphate @25 kg/ha followed by foliar application (0.5% Zn sulphate) at heading and early milk stage was found superior compared to all other treatments with a yield advantage of 14.0 and 24.5 percent over no zinc application in NEPZ and CZ, respectively. In NHZ, soil application with Zn sulphate @25 kg/ha and Zn sulphate @25 kg/ha + foliar application at

heading/early milk stage were at par and superior to other treatments. Soil application with Zn sulphate @25 kg/ha recorded 12.6 percent higher yield as compared to no zinc application.

QUALITY EVALUATION

Malt barley trials

The malt is one the major industrial use of barley and to make higher quality malt the raw material should have certain minimum quality traits. Though several varieties of malt barley have been released in India in past years having good quality with high yield and disease tolerance. However due to shorter grain filling duration in Indian conditions, the grain quality is slightly inferior to the imported malt especially from the regions having longer grain filling duration. The efforts are going on to achieve the same quality under Indian growing conditions with maintain higher yield and not compromising disease resistance. In the current interactions with the industry it has been noted that there are two major traits where improvements are needed: lower grain & wort β-glucan and higher diastatic power. The barley improvement unit scientists interacted with the industry and barley breeders to update the malting quality guidelines in country by updating the traits and revising the scoring system. Accordingly, the analytical guidelines being followed have been revised in June 2020 and circulated among all the breeders in the programme and all the major malt/brewing industries. The revised guidelines are taken into consideration from evaluation of current season material and interpretations done accordingly. The awareness programmes for farmers were organized to popularize malt barley cultivation in Haryana and Rajasthan under one consultancy project with M/s AB InBev India.

This year a total 270 samples of malt barley received from eight locations of North Western Plain Zone were analysed in the quality laboratory of Barley Improvement programme. The samples consisted a set of nine Advanced Varietal Trial experiment having four entries (DWR182, DWR196, DWR197 and PL908) with five checks. The Initial Varietal Trial (IVT) had 17 entries with five checks. The material having desirable values for different traits has been presented in the table. In the AVT samples the genotype DWRB182 has been found to contain the lowest beta glucan content (4.5% db) among all the AVT genotypes with reasonably good diastatic power (80^{o}L) and hot extract value of 80% (fgdb).

Promising entries for individual malting quality trait*

Traits	Promising entries
1000 grain weight	PL908 (6R), DWRB182
Bold Grains	DWRB 196
Protein content	DWRB182, DWRB 197, BH1026, DWRB212, BH1027, PL916, PL919, PL912, RD3026
Husk Content	DWRB209
Grain B- glucan	DWRB182, RD3025, DWRB211
Malt Friability	DWRB 197, DWRB211, BH1027, PL912, PL919, PL916
Hot water extract	DWRB211, DWRB209, BH1027, RD3024, UPB1090
Filtration Rate	DWRB182, DWRB209, RD3025
Diastatic Power	DWRB 197, PL916, BH1027, BH1026
FAN Content	RD 3025
Wort β- glucan	DWRB 211, BH 3025, DWRB 197, DWRB 182
Over all MQ	**DWRB 182, DWRB 197, DWRB 211, DWRB 209, BH 1027**

**Excluding the entry from private industry*

Barley quality screening nursery

This year nursery had two components ie. for better malting quality traits and hulless barley with better grain quality traits. In the malting quality part, a total of 28 genotypes including seven checks was grown at Karnal, Hisar, Ludhiana, Pantnagar and Kanpur. A 2-row entry ICARDA-5 (LEGACY/4/TOCTE//GOB/HUMAI10/3/ATAH92/ALELI/5/ARUPO/K8755//MORA) and one six-row entry ICARDA-11 (SEN/5/LEGACY/4/TOCTE//GOB/HUMAI10/3/ATAH92/ ALELI) have been found promising. Among the hulless genotypes BCU 8028 has been found promising with respect to grain beta glucan content.

Promising sources for different traits* in BQSN

Traits	Promising entries
Hectoliter Weight**	BCU 4966, DWR 49
Thousand grain weight (42-48 g)**	ICARDA-5. ICARDA-28, ICARDA-18, ICARDA-1, BK-306, ICARDA-8, ICARDA-12, ICARDA-17, BCU 2030, ICARDA-9
Bold Grains**	BCU 2241
Protein content (12-13%)**	BCU-4966, ICARDA-27, ICARDA-26
Starch content**	BK-306, ICARDA-9, ICARDA-8
Grain B- glucan***	ICARDA-5
Malt Friability (> 65%)***	ICARDA-8, ICARDA-9, ICARDA-11
Hot water extract***	ICARDA-9
Filtration Rate***	ICARDA-9, DWR 49, ICARDA-11
Diastatic Power***	BK-306, ICARDA-11, DWR 49, ICARDA-8, ICARDA-9, ICARDA-4, ICARDA-28
Kolbach Index	ICARDA-4, ICARDA-17, ICARDA-8, ICARDA-11

*Better than checks ** Based on mean of three locations (Hisar, Karnal and Pantnagar)
*** Karnal location only

Feed barley

The feed grain samples (711) from various trials and grown at different locations were analyzed for physical parameters and protein content. A total of around 500 samples were received encompassing different trials grown in different zones and promising entries identified.

Entries with better values for individual grain quality traits in respective trials

Trial	Test weight (kg/hl)	Thousand grain weight (g)	Bold grain (%)	Thin grain (%)	Grain Protein (%)
IVT FB (IR)	PL 920	HUB 271	DWRB 137 (c)	DWRB 137 (c)	UPB1087, PL920
AVT FB (IR)-NWPZ	RD 2994, UPB 1080	RD 2994	RD 2994	RD 2994	-
IVT/AVT (HL)	K 1149	PL 891 (c)	DWRB 204, DWRB 217	DWRB 204, DWRB 217	DWRB 217
IVT (RF)-NEPZ	NDB 1748, PL 925	HUB 69, PL 925	DWRB 213, PL 918, HUB 69, RD 3022, RD 3019, RD 3021, RD 3020, PL 925, HUB 270, NDB 1748	DWRB 213, PL 918, HUB 69, RD 3022, RD 3019, RD 3020, PL 925, HUB 270, NDB 1748	PL 918, PL 925
AVT (SAL/ ALK)	KB 1845, RD 3015, HUB 273, BH 1032, RD 3018	RD 3015, HUB 273, NDB 1742, DWRB 214, RD 3016, BH 1033, KB 1815	HUB 273	HUB 273	KB1845, NDB 1730
AVT-RF-NHZ	BHS 352 (c)	VLB 118 (c)	VLB 118 (c)	VLB 118 (c)	BHS 482

FRONT LINE DEMONSTRATIONS

During the *rabi* crop season 2019-20, 250 Barley Frontline Demonstrations (BFLDs) of one acre each were allotted to 21 cooperating centers all over India in six states namely, HP, UP, Punjab, Haryana, Rajasthan and MP. Out of these, 231 were conducted by 20 centers, covering 237 acres area of 251 farmers. Improved barley varieties with complete package of practices (irrigation management, nutrient management, weed control, seed treatment etc.) were demonstrated.

State wise distribution of barley FLDs and yield gains during *rabi* 2019-20 (in acres)

State	BFLDs Allotted	BFLDs Conducted	No. of farmers	**BFLDs yield (q/ha)**	**Check yield (q/ha)**	**Gain (%)**
HP	24	17	24	25.93	21.03	23.31*
UP	48	36	36	42.43	32.38	31.05***
Punjab	20	20	22	44.13	39.72	11.10***
Haryana	36	36	40	47.96	45.26	05.95**
Rajasthan	62	62	64	55.01	49.15	11.92***
MP	60	60	65	36.09	29.27	23.31***
	250	**231**	**251**			

**** Significant at 1 percent level, ** Significant at 5 percent level,*

Zone wise distribution of barley FLDs and yield gains during *rabi* 2019-20 (in acres)

Zone	**BFLDs Allotted**	**BFLDs Conducted**	**BFLDs yield (q/ha)**	**Zonal mean yield (q/ha)**	**Gain (%)**
NHZ	24	17	25.93	20.75	24.94**
NEPZ	48	36	42.43	31.11	36.39***
NWPZ	94	94	52.82	46.38	13.88***
CZ	84	84	37.87	31.30	21.01***
	250	**231**			

**** -Significant at 1 per cent level*

The highest gain in barley yield was recorded in UP (31.05 %) followed by HP and MP (23.31). The lowest gain in yield was reported in Haryana (5.95 %). The yield gain due to improved varieties over regional mean yield was highest in NEPZ (36.39%) followed by NHZ (24.94 %), CZ (21.01%) and NWPZ (13.88 %). The yield gain due to improved varieties over check mean yield was highest in NEPZ (31.05 %) followed by NHZ (23.31 %), CZ (19.55 %) and NWPZ (09.57 %). Therefore, efforts should be made to increase barley yield in the NEPZ and CZ by promoting recent barley production technologies in collaboration with the state department of agriculture.

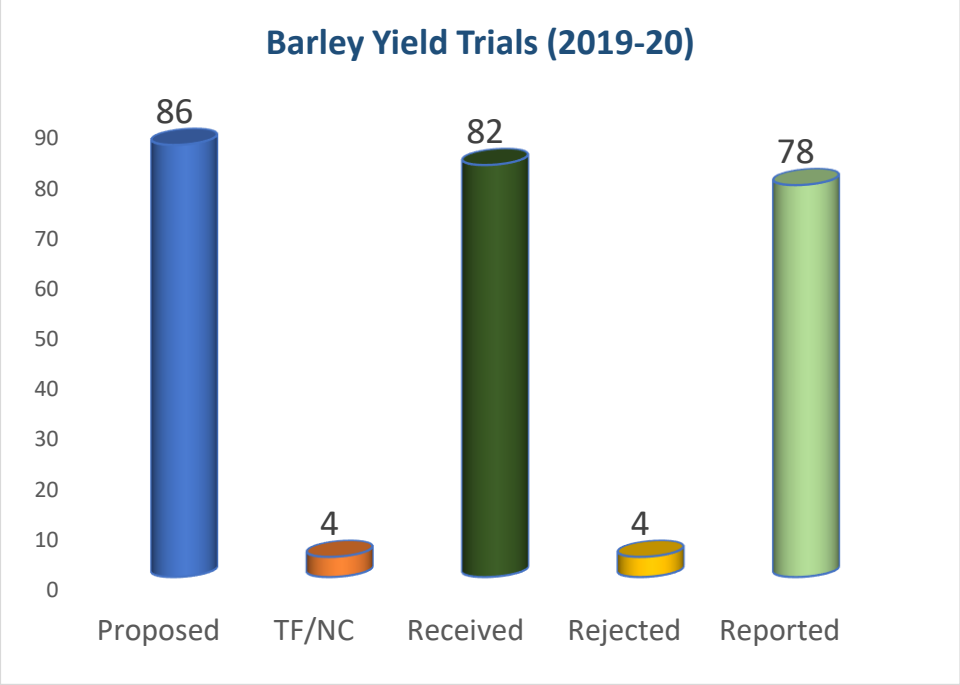
In NHZ, BHS 400 was the highest average yielding (30.58 q/ha) variety at Bajaura centre. In NEPZ, RD 2907 at Mirzapur (52.88 q/ha), in NWPZ RD 2907 at Durgapura (65.15 q/ha) and RD 2899 at Vidisha (50.55 q/ha) in CZ were the highest average yielding varieties.

BREAK UP OF BARLEY IMPROVEMENT YIELD TRIALS

(RABI 2019-20)

S. No.	Trial Name	No. of centers				
		Proposed	Not Conducted / Failed/ Not Received	Data Received	Data Rejected	Data Reported
1.	AVT-RF-NHZ	11	1 (Khudwani)	10	1 (Ranichauri, LSM)	9
2.	AVT-IR-FB-NWPZ	8	-	8	-	8
3.	AVT-IR-MB-NWPZ	9	1 (Mathura)	8	-	8
4.	AVT-SST-NWPZ/NEPZ	7	1(Banasthali)	6	1 (Rampura,	5
5.	IVT-IR-FB-NWPZ/NEPZ/CZ	18	-	18	1 (Kalyani, LSM)	17
6.	IVT/AVT-IR-HLS NWPZ/ NEPZ/CZ	15	-	15	1 (Morena, HCV)	14
7.	IVT-IR-MB-NWPZ	10	1 (Mathura)	9	-	9
8.	IVT-RF-NEPZ	8	-	8	-	8
	TOTAL	**86**	**4**	**82**	**4**	**78**
				95.3%	**4.8%**	**90.7% (P) 95.1% (R)**

P= percent of proposed trials, R= percent of received trials



Performance of test sites during Rabi 2019-20

(A) MAIN CENTRES

No.	Centres	No. of Trials			Trials Rejected		
		Allotted	Name	Conducted	No.	Name	Reason
1.	Almora	1	AVT-RF-NHZ	1	-	-	-
2.	Bajaura	1	AVT-RF-NHZ	1	-	-	-
3.	Durgapura	5	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB	5	-	-	-
4.	Faizabad	4	AVT-SST, IVT-RF-NEPZ, IVT-IR-FB, IVT/AVT-Hulless	4	-	-	-
5	Hisar	6	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB, AVT-SST	6	-	-	-
6.	Kanpur	3	IVT-RF-NEPZ, IVT-IR-FB, IVT/AVT-Hulless	3	-	-	-
7.	Karnal	6	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB, AVT-SST	6	-	-	-
8.	Ludhiana	5	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB	5	-	-	-
9.	Shimla	1	AVT-RF-NHZ	1	-	-	-
10.	Varanasi	3	IVT-RF-NEPZ, IVT-IR-FB, IVT/AVT-Hulless	3	-	-	-
11.	Pantnagar	5	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB	5	-	-	-
	Total (A)	**40**		**40**	**-**	**-**	**-**

Contd….

Performance of test sites during Rabi 2019-20

(B)TESTING CENTRES /SAU / DEPTT. OF AGRIC.

No.	Centres	No. of Trials			Trials Rejected		
		Allotted	Name	Conducted	No.	Name	Reason
1	Bawal	2	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ,	2	-	-	-
2	Banasthali	1	AVT-SST	0	-	-	-
3	Bathinda	2	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ,	2	-	-	
4	Berthein	1	AVT-RF-NHZ	1	-	-	-
5	Chiyanki	1	IVT-RF-NEPZ	1	-	-	-
6	Dalipnagar	1	AVT-SST	1	-	-	-
7	Fathpur	1	AVT-SST	1	-	-	-
8	Gwalior	2	IVT-IR-FB, IVT/AVT-Hulless	2	-	-	-
9	Jhansi (CAU)	1	IVT-AVT-IR-HLS	1			
10	Kalyani	1	IVT-FB-IR	1	1	IVT-IR-FB	LSM
11	Kangra	1	AVT-RF-NHZ	1	-	-	-
12	Katrain	1	AVT-RF-NHZ	1	-	-	-
13	khudwani	1	AVT-RF-NHZ	0	-	-	-
14	Majhera	1	AVT-RF-NHZ	1	-	-	-
15	Malan	1	AVT-RF-NHZ	1	-	-	-
16	Mathura	2	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ,	2	2	IVT-MB-TS, AVT-MB-TS	TF
17	Morena	2	IVT-IR-FB, IVT/AVT-Hulless	2	1	IVT-IR-HLS	HCV
18	Modipuram	5	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT-IR-FB, IVT/AVT-IR-HLS , AVT-IR-FB	5	-	-	-
19	Pusa, CAU	2	IVT-IR-FB, IVT-RF-NEPZ	2	-	-	-
20	Rajauri	1	AVT-RF-NHZ	1	-	-	-
21	Rampura	1	AVT-SST	1	1	AVT-SST	UR
22	Ranchi	2	IVT-IR-FB, IVT-RF-NEPZ	2	-	-	-
23	Ranichauri	1	AVT-RF-NHZ	1	1	AVT-FB-NHZ	LSM
24	Sabour	2	IVT-IR-FB, IVT-RF-NEPZ	2	-	-	-
25	Saini	1	IVT-RF-NEPZ	1	-	-	-
26	Sriganganagar	1	IVT-IR-MB-NWPZ	1	-	-	-
27	Tabiji	2	IVT-IR-FB, AVT-IR-FB	2	-	-	-
28	Tikamgarh	1	IVT/AVT-Hulless	1	-	-	-
29	Udaipur	3	IVT-IR-FB, IVT/AVT-Hulless,AVT-IR-FB	3	-	-	-
30	Vijapur	2	IVT-IR-FB, IVT/AVT-Hulless	2	-	-	-
	Total (B)	**46**		**44**			

HCV =High CV, TF = Trial failed, UR- unrealistic data, LSM = Low site mean

Trial wise locations during Rabi 2019-20

SN	Trial Name	Locations	Total
1	AVT-RF-NHZ	Bajaura, Berthein, Kangra, Katrain, Malan, Shimla, Almora, Ranichauri, Majhera, Rajouri, Khudwani	11
2	AVT-IR-MB-NWPZ	Bawal, Hisar, Karnal, Ludhiana, Bathinda, Durgapura, Mathura, Pantnagar, Modipuram	9
3	AVT-IR-FB-NWPZ	Hisar, Karnal, Ludhiana, Durgapur, Tabizi, Udaipur, Modipuram, Pantnagar	8
4	AVT-SST-NWPZ/NEPZ	Dalipnagar, Faizabad, Hisar, IIWBR Hisar, Banasthali, Rampura, Fatehpur	7
5	IVT/AVT-IR-HLS-NWPZ /NEPZ/CZ	Hisar, Karnal, Ludhiana, Durgapura, Tikamgarh, Udaipur, Pantnagar, Kanpur, Varanasi, Faizabad, Morena, Gwalior, Jhansi (CAU), Vijapur, Modipuram	15
6	IVT-IR-MB-NWPZ	Bawal, Hisar, Karnal, Ludhiana, Bathinda, Durgapura, Mathura, Pantnagar, SG Nagar, Modipuram	10
7	IVT-IR-FB-NWPZ/NEPZ/CZ	Hisar, Karnal, Ludhiana, Durgapura, Tabiji, Udaipur, Pantnagar, Kanpur, Varanasi, Faizabad, Kalyanai, Morena, Gwalior, Pusa (CAU), Sabour, Ranchi, Vijapur, Modipuram	18
8	IVT-RF-NEPZ	Kanpur, Varanasi, Faizabad, Pusa(CAU), Sabour, Saini, Ranchi, Chiyanki	8
		Total	**86**

Center wise Summary Rabi 2019-20

S No.	Centre	Trials proposed	Total
(A) MAIN CENTRES			
1.	Almora	AVT-RF-NHZ	*1*
2.	Bajaura	AVT-RF-NHZ	*1*
3.	Durgapura	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB	*5*
4.	Faizabad	AVT-SST, IVT-RF-NEPZ, IVT-IR-FB, IVT/AVT-Hulless	*4*
5	Hisar	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB,AVT-SST	*6*
6.	Kanpur	IVT-RF-NEPZ, IVT-IR-FB, IVT/AVT-Hulless	*3*
7.	Karnal	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB,AVT-SST	*6*
8.	Ludhiana	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB	*5*
9.	Shimla	AVT-RF-NHZ	*1*
10.	Varanasi	IVT-RF-NEPZ, IVT-IR-FB, IVT/AVT-Hulless	*3*
11.	Pantnagar	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT/AVT-Hulless, IVT-IR-FB, AVT-IR-FB	*5*
		Sub Total	***40***
(B) TESTING CENTRES /SAU / DEPTT. OF AGRIC.			
1.	Bawal	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ,	*2*
2.	Banasthali	AVT-SST	*1*
3.	Bathinda	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ,	*2*
4.	Berthein	AVT-RF-NHZ	*1*
5.	Chiyanki	IVT-RF-NEPZ	*1*
6.	Dalipnagar	AVT-SST	*1*
7.	Fatehpur	AVT-SST	*1*
8.	Gwalior	IVT-IR-FB, IVT/AVT-Hulless	*2*
9.	Jhansi (CAU)	IVT-AVT-IR-HLS	*1*
10.	Kalyani	IVT-FB-IR	*1*
11.	Kangra	AVT-RF-NHZ	*1*
12.	Katrain	AVT-RF-NHZ	*1*
13.	Khudwani	AVT-RF-NHZ	*1*
14.	Majhera	AVT-RF-NHZ	*1*
15.	Malan	AVT-RF-NHZ	*1*
16.	Mathura	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ,	*2*
17.	Morena	IVT-IR-FB, IVT/AVT-Hulless	*2*
18.	Modipuram	IVT-IR-MB-NWPZ, AVT-IR-MB-NWPZ, IVT-IR-FB, IVT/AVT-IR-HLS ,	*5*
19.	Pusa, CAU	IVT-IR-FB, IVT-RF-NEPZ	*2*
20.	Rajauri	AVT-RF-NHZ	*1*
21.	Rampura	AVT-SST	*1*
22.	Ranchi	IVT-IR-FB, IVT-RF-NEPZ	*2*
23.	Ranichauri	AVT-RF-NHZ	*1*
24.	Sabour	IVT-IR-FB, IVT-RF-NEPZ	*2*
25.	Saini	IVT-RF-NEPZ	*1*
26.	Sriganganagar	IVT-IR-MB-NWPZ	*1*
27.	Tabiji	IVT-IR-FB, AVT-IR-FB	*2*
28.	Tikamgarh	IVT/AVT-Hulless	*1*
29.	Udaipur	IVT-IR-FB, IVT/AVT-Hulless,AVT-IR-FB	*3*
30.	Vijapur	IVT-IR-FB, IVT/AVT-Hulless	*2*
		Sub Total	**46**
		G Total	**86**

PARENTAGE OF BARLEY STRAINS UNDER COORDINATED EVALUATION DURING RABI 2019-20

No.	CONTRIBUTING CENTRE	SYMBOLS	Entries
1	ALMORA, V.P.K.A.S.	VLB	5
2	BAJAURA, R.R.S. (CSKHPKV)	HBL	5
3	DURGAPURA, R.A.R.I. (SKRAU)	RD	17
4	FAIZABAD, N.D.U.A&T.	NDB	4
5	HISAR, C.C.S.H.A.U.	BH	8
6	KANPUR, C.S.A.U.&T.	KB	13
7	KARNAL, ICAR-I.I.W.B.R.	DWRB	13
8	LUDHIANA, P.A.U.	PL	11
9	PANTNAGAR, G.B.P.U.A.&T.	UPB	9
10	SHIMLA, RS, I.A.R.I	BHS	5
11	VARANASI, B. H. U.	HUB	6
12	M/s AB InBev Ltd. Bengaluru	ABI	1

SN	Entries	Parentage
ICAR-IARI, RS, Shimla		
1	BHS478	BHS385/BHS369
2	BHS479	BBM556/BHS169//BHS369
3	BHS480	BLG132/BHS369
4	BHS481	BHS369/HBL113
5	BHS482	BHS385/BHS369
GBPUA&T, Pantnagar		
6	UPB 1080	AHOR1489.58//GLORIA-BAR/COPAL/3/PRO-/4/CAPUL/TOCTE/5/ICARO
7	UPB 1083	RD 2552 / DWRUB 73
8	UPB 1084	UPB 1021/DWRB 107
9	UPB 1085	TOCTE/PETUNIA 2//PETUNIA1
10	UPB 1086	MSEL//LIMON/BICHY2000
11	UPB 1087	RD 2552/IBYT-LRAM-12
12	UPB 1088	RD2552/P.STO/3/LBIRAN/UNA80//LIGNEEG40/4/BLLU/5…//RD2035
13	UPB 1089	UPB 1021 / DWRB 107
14	UPB 1090	RD 2552 / DWRUB 73
ICAR-VPKAS, Almora		
15	VLB 165	TOCTE/PETUNIA 2//PETUNIA 1
16	VLB 166	CABUYA/MJA//PETUNIA1/5/PENCO/CHEVRON-BAR/3/ATACO/BERMEJO //HIGO/4/PETUNIA 1
17	VLB 167	ALANDA//LIGNEE527/ARAR/3/BF891M-653/4/GIZA130
18	VLB 168	CANELA/5/PENCO/CHEVRON-BAR
19	VLB 169	Barque/Arta
CSKHPKV, RRS, Bajaura		
20	HBL 864	HBL 113 / Dolma
21	HBL 865	HBL 113 / HBL 316
22	HBL 866	HBL 276 / HBL 113
23	HBL 867	WI3167/6/ANCA/2469//TOJI/3/SHYRI/4/ATACO/5/ALELI/7/Arar/Lignee527// Zy /DL69
24	HBL 868	(CABUYA/MJA//PETUNIA1/5/PENCO/CHEVRON-BAR/3/ATACO/BERMEJO //HIGO/4/PETUNIA1
CCSHAU, Hisar		
25	BH1026	VLB 132 / BH 902
26	BH1027	VLB 132 / BH 885
27	BH1028	RD 2870 / BH 902
28	BH1029	RD 2833 / RD 2870

29	BH1030	RD 2870 / BH 885
30	BH1031	RD 2784 / BHS 415
31	BH1032	BH 965 / BH 885
32	BH1033	BH 942 / BH 393
BHU, Varanasi		
33	HUB 269	31st INBON-04 / RD 2552
34	HUB 270	RD-2618 /RD-2660
35	HUB 271	V-MORLES / ATHUALPA
36	HUB 272	BH 550 / IBON-39-1
37	HUB 273	31st INBON-18/ RD 2508
38	HUB 274	JB 18 / 31st IBON-4-02
SKNAU, RARI, Durgapura		
39	RD 2994	RD2624 / NDB1173
40	RD3011	RD 2035/RD 2624// RD 2715
41	RD3012	RD 2660 / NDB1173
42	RD3013	RD 2552 / PL 419 // RD 2508
43	RD3014	RD 2552 / BH 393
44	RD3015	RD 2715 / RD 2552
45	RD3016	RD 2715 / RD 2552
46	RD3017	RD 2552 / PL 419 // RD 2508
47	RD3018	RD 2592 / RD 2607
48	RD-3019	RD 2715 / RD 2552
49	RD-3020	RD 2035/ RD 2624//RD 2715
50	RD-3021	DWR 64 / RD 2503
51	RD-3022	RD 2607 / RD 2651
52	RD3023	DWR 28 / RD 2651
53	RD3024	RD 2607 / RD 2668
54	RD3025	RD 2552 / DL 419 // RD 2508
55	RD3026	RD 2607 / RD 2668
PAU, Ludhiana		
56	PL 906	RD2503/WSA353 (*H. spontaneum*)
57	PL 908	RD2740/RD2743
58	PL912	EC492253/PL838
59	PL911	DWR83/RD2798
60	PL915	PL847/RD2798
61	PL916	CAPUL/ZIGZIG (*IBON-2013-14-E22*)
62	PL917	STANDER-BAR/CABUYA/6/ROBUR-BAR/142-B//ASTRIX/SUTTER334.3/3/ SUMBARD400/5/CI10622/CI5824//PAICO/3/GLORIA-BAR/COPAL/4/BBSC (*IBON-2013-14-E83*)
6	PL918	VMorales/6/LEGACY//PENCO/CHEVRON-BAR/7/LIGNEE527/GERBEL/3/BOY-B*2/ SURB//CI12225.2D/4/GLORIA-BAR/COME (*IBON-2014-15-E87*)
63	PL919	PFC9215/3/ZHEDAR#1/SHYRI//OLMO *(IBON-2015-16-E128)*
64	PL920	LBIRAN/UNA80//LIGNEE640/6/VMorales (IBYT-2014-15-E7)
65	PL925	VJM315/BH919
CSAUA&T, Kanpur		
66	KB 1707	Manjula/DWRUB52
67	KB 1814	Manjula/DWRUB 52
68	KB 1815	Ghinneri(smooth_awns)/6/JLB70-01/5/DeirAlla106//DL70/Pyo/3/RM1508 /4/Arizona5908/Aths//Avt/Attiki/3/Ager *(4thGSBSN2016-17-52)*
69	KB 1816	K 882/NDB 1173
70	KB 1817	RD 2784/Jyoti
71	KB 1822	K 996/K 508
73	KB 1823	K996/K508
74	KB 1830	RD 2784/Jyoti
75	KB 1832	K 603 x RD 2715
76	KB 1843	LACEY/9/MOLA/BERMEJO//NISPERO/5/CM67-B/RYE//CAM-B/3/ROW906.73/4/ GLORIA-BAR /COME/6/LINO/7/PINON/8/ PETUNIA 1
77	KB1827	K 508/RD 2676

78	KB 1845	PETUNIA1/5/POST/COPAL//GLORIA-BAR/COME/3/SIND89A-148/4/CARD/6/ GLORIA-BAR/COPAL//BLLU/3/PETUNIA 1/7/PINON
79	KB 1848	ICNB93-369/IRAN(Kordistan)
NDUA&T, Faizabad		
80	NDB 1730	Avt/Attiki//M-AH73-337-1/3/Aths/Lignee686/4/HB42
81	NDB 1738	NACKTA/HJA A33//FNCICBS365
82	NDB 1742	Avt/Attiki //M-AH73-337-1/3/Aths/Lignee686/4/HB42
83	NDB 1748	CEV96060/MSEL//CANELA ACBSSO
ICAR-IIWBR, Karnal		
84	DWRB 204	ALELI/4/EGYPT4/TERAN78//P.STO/3/QUINA (Hulless)
85	DWRB182	DWRUB52/DWRB78
86	DWRB 196	DWRUB52/DWR81
87	DWRB 197	DWRUB52/DWR84
88	DWRB209	MARINE/DWR84
89	DWRB210	DWRUB52/DWRB69
90	DWRB211	DWRUB64/UBE1005//DWRB73/DWR37
91	DWRB212	DWRUB52/DWR71
92	DWRB213	CONCHITA/DWRUB64
93	DWRB214	EC361898
94	DWRB215	EC361899
95	DWRB216	BLLU/5/PETUNIA1/6/LEGACY//PENCO/CHEVRON-BAR
96	DWRB217	PETUNIA2/M112
M/s AB InBev Ltd. Bengaluru		
97	ABI Kranti	Unknown
Checks		
1	BH902	BH495/RD2552
2	BH946	BHMS22A/BH549//RD2552
3	BHS352	HBL240/BHS504//VLB129
4	BHS400	34th IBON-9009
5	DWRB101	DWR28/BH581
6	DWRB123	DWRUB54/DWR51
7	DWRB137	DWR28/DWRUB64
8	DWRB160	DWRB62/DWRB73
9	HBL113	SELECTION FROM ZYPHYZE
10	K603	K257/C138
11	K 1149	K12/K572-10//EB410
12	Karan16	AZAM (DWARF)1/EB7576
13	Lakhan	K12/IB226
14	NDB943	K 1178/Karan 748
15	NDB1173	BYTLRA 3-(1994-95)/NDB217
16	NDB1445	NDB940/Ratna
17	PL891	IBON 343/12th HSBN-176 (Hulless)
18	RD2552	RD2035/DL472
19	RD2794	RD2035/RD2683
20	RD2849	DWRUB52/PL705
21	RD2899	RD2592/RD2035//RD2715
23	RD2907	RD103/RD2518//RD2592
24	VLB118	14th EMBSN-9313

ADVANCED VARIETAL TRIAL (IRRIGATED) MALT BARLEY- NWPZ

The Advanced Varietal Trial (AVT) of malt barley was proposed at 9 locations in North Western Plains Zone (NWPZ) of the country. The trial was conducted at all locations as per recommended layout but due to the stray animals grazing at Mathura centre, the trial was rejected by the monitoring team. Finally, the data from 8 locations only were considered for zonal compilation.

The trial comprised of 9 entries, including four test entries and five (DWRB101, DWRB123, DWRB160, RD2849 and BH902) check. Entry DWRB182* was in final year of testing.

The trial was monitored at all centres, during proper crop stage and were conducted properly except complete trial failure (due to grazing by stray animals) at Mathura centre. No entry was observed with segregation/ mixtures or off types at any location.

No major disease/ pest incidence was reported at the trial conducting centers in the season except net and spot blotch incidence at Hisar centre and yellow rust incidence up to 20S in check BH902 at Ludhiana and overall, the crop was in good health.

In case of grain yield, the trials mean value ranged from 35.9 q/ha (Ludhiana) to 65.5 q/ha (Durgapura). Amongst the genotypes, entry DWRB196 ranked first with 53.3 q/ha mean grain yield followed by the best check variety DWRB123 (53.0 q/ha) in the first non-significant group.

Grain Yield Data (2019-20)

Trial: AVT-IR-MB **Zone: NWPZ**

SN	Varieties	Code No.	Karnal			HAU Hisar			Modipuram			Durgapura			Pantnagar		
			Yield	**Rk**	**G**	**Yield**	**Rk**	**G**	**Yield**	**Rk**	**G**	**Yield**	**Rk**	**G**	**Yield**	**Rk**	**G**
1	DWRB182	AVT-IR-MB-NWPZ-6	32.7	7	0	31.4	9	0	49.8	9	0	66.2	6	1	44.8	5	0
2	DWRB 196	AVT-IR-MB-NWPZ-1	37.4	5	0	50.7	1	1	62.5	1	1	66.4	4	1	44.2	7	0
3	DWRB 197	AVT-IR-MB-NWPZ-9	46.7	1	1	46.9	3	1	57.1	7	0	61.5	8	0	29.3	9	0
4	PL908	AVT-IR-MB-NWPZ-3	32.2	8	0	46.1	4	0	56.8	8	0	67.2	3	1	42.8	8	0
5	DWRB 101 (C)	AVT-IR-MB-NWPZ-4	44.5	3	1	38.0	8	0	62.1	2	1	68.8	2	1	45.9	4	0
6	DWRB123 (C)	AVT-IR-MB-NWPZ-7	46.2	2	1	38.3	7	0	60.5	3	0	71.0	1	1	49.9	2	0
7	DWRB160 (C)	AVT-IR-MB-NWPZ-5	34.6	6	0	48.0	2	1	57.2	6	0	56.3	9	0	44.5	6	0
8	RD2849 (C)	AVT-IR-MB-NWPZ-2	38.8	4	0	44.0	6	0	59.9	4	0	66.3	5	1	51.0	1	1
9	BH902 (6RC)	AVT-IR-MB-NWPZ-8	29.4	9	0	45.2	5	0	57.4	5	0	65.8	7	1	48.2	3	0
		G.M.	**38.1**			**43.2**			**58.1**			**65.5**			**44.5**		
		S.E.(M)	1.0			1.7			0.7			2.2			0.2		
		C.D.	2.5			4.1			1.7			5.4			0.5		
		C.V.	5.5			7.8			2.4			6.8			1.0		
		DOS	15.11.2019			13.11.2019			13.11.2019			10.11.2019			11.11.2019		

Grain Yield Data (2019-20)

Trial: AVT-IR-MB **Zone: NWPZ**

SN	Varieties	Code No.	Bathinda			Bawal			PAU Ludhiana			NWPZ		
			Yield	**Rk**	**G**	**Yield**	**Rk**	**G**	**Yield**	**Rk**	**G**	**Yield**	**Rk**	**G**
1	DWRB182*	AVT-IR-MB-NWPZ-6	53.8	7	0	51.8	9	0	37.1	3	0	**45.9**	**9**	**0**
2	DWRB196	AVT-IR-MB-NWPZ-1	59.3	4	1	62.3	2	1	43.6	1	1	**53.3**	**1**	**1**
3	DWRB197	AVT-IR-MB-NWPZ-9	53.6	9	0	62.4	1	1	34.3	6	0	**49.0**	**7**	**0**
4	PL908	AVT-IR-MB-NWPZ-3	60.8	2	1	61.3	3	1	41.7	2	1	**51.1**	**4**	**0**
5	DWRB101(C)	AVT-IR-MB-NWPZ-4	57.7	6	1	61.2	4	1	30.1	8	0	**51.1**	**5**	**0**
6	DWRB123(C)	AVT-IR-MB-NWPZ-7	60.4	3	1	60.3	5	1	37.1	4	0	**53.0**	**2**	**1**
7	DWRB160(C)	AVT-IR-MB-NWPZ-5	53.7	8	0	56.3	7	0	28.8	9	0	**47.4**	**8**	**0**
8	RD2849(C)	AVT-IR-MB-NWPZ-2	58.8	5	1	58.5	6	1	36.2	5	0	**51.7**	**3**	**0**
9	BH902(6RC)	AVT-IR-MB-NWPZ-8	61.0	1	1	52.1	8	0	33.8	7	0	**49.1**	**6**	**0**
		G.M.	**57.7**			**58.5**			**35.9**			**50.2**		
		S.E.(M)	1.6			2.4			1.3			**0.5**		
		C.D.	3.8			5.8			3.1			**1.3**		
		C.V.	5.5			8.1			7.3					
		DOS	19.11.2019			18.11.2019			23.11.2019					

Ancillary Data (2019-20)

Trial: AVT (Malt Barley) **ZONE: NWPZ**

SN	Varieties	Code No.	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			DISEASE REACTION (Mean & HS)			
			H. days	M. days	PH (cm)	Tillering /m	Spike L (cm)	2/6 R	Colour	1000 g.w (g)	H/N	Rusts		Leaf Blight	
												YR*	LR	NB**	SB**
1	DWRB182	AVT-IR-MB-6	92 (74-99)	136 (125-151)	98 (88-104)	123 (97-176)	8 (8.6-11.5)	2	PY	46 (42-52)	H	F	-	14	14
2	DWRB 196	AVT-IR-MB-1	94 (74-99)	136 (122 -155)	105 (88-120)	121 (95-124)	9 (8.6-11.0)	2	PY	61 (46-69)	H	F	-	24	14
3	DWRB 197	AVT-IR-MB-9	93 (80-99)	135 (121-151)	96 (86-105)	132 (110-156)	7 (8.6-11.8)	2	PY	52 (45-56)	H	F	-	14	14
4	PL908	AVT-IR-MB-3	95 (76-101)	138 (123-155)	107 (87-121)	103 (82-121)	7 (8.6-11.2)	6	PY	45 (39-52)	H	F	-	25	14
5	DWRB 101(C)	AVT-IR-MB-4	90 (72-98)	135 (122-152)	100 (86-111)	141 (98-190)	8 (8.6-11.3)	2	PY	53 (48-60)	H	F	-	12	14
6	DWRB123 (C)	AVT-IR-MB-7	91 (73-97)	135 (120-154)	100 (86-109)	137 (99-203)	8 (8.6-11.6)	2	PY	55 (49-60)	H	F	-	12	14
7	DWRB160 (C)	AVT-IR-MB-5	94 (74-101)	137 (117-155)	102 (87-115)	110 (96-121)	9 (8.6-11.4)	2	PY	63 (55-68)	H	F	-	13	14
8	RD2849 (C)	AVT-IR-MB-2	91 (73-98)	135 (126-153)	101 (88-109)	147 (91-193)	8 (8.6-11.1)	2	PY	50 (44-56)	H	F	-	23	14
9	BH902 (6RC)	AVT-IR-MB-8	96 (80-105)	141 (128-156)	110 (89-123)	109 (92-132)	9 (8.6-11.7)	6	PY	46 (41-52)	H	20S	-	12	14

** YR data from Ludhiana centre only, ** Net and Spot blotch data from Hisar centre only*

INITIAL VARIETAL TRIAL (IRRIGATED) MALT BARLEY- NWPZ

The Initial Varietal Trial (IVT) of malt barley was proposed at 10 locations in North Western Plains Zone (NWPZ) of the country. The trial was conducted at all locations as per recommended layout. The trial was rejected by the monitoring team at Mathura centre due to the stray animals grazing. Finally, the data from 9 locations only were considered for zonal compilation.

The trial consisted a total of 22 genotypes including 17 test entries and five checks (DWRB101, DWRB123, DWRB160, RD2849 and BH946). Among 17 entries, three entries were contributed from CCSHAU-Hisar, two were contributed from Pantnagar, four from IIWBR-Karnal, three from PAU Ludhiana, four from Durgapura and one from private company. The trial was monitored at all centres, during proper crop stage. Entry DWRB212 was recorded as segregating for the shape and colour of rudimentary spikelet. While, entries BH1026, BH1027, BH1028 and RD3023 were observed with a few off-types.

No major disease/ pest incidence was reported at the trial conducting centers in the season except net and spot blotch incidence at Hisar centre and overall, the crop was in good health.

In case of grain yield, the trials mean value ranged from 40.6 q/ha (Hisar) to 76.7 q/ha (Sriganganagar). Amongst the genotypes, the entry UPB1090 ranked first with 63.1 q/ha followed by the entry UPB1089 (62.4 q/ha), check variety DWRB160 (62.1q/ha) and the entry RD3026 (61.5 q/ha) in the first non-significant group.

Grain Yield Data (2019-20)

Trial: IVT-IR-MB **Zone: NWPZ**

SN	Varieties	Code No.	Karnal			HAU Hisar			Modipuram			Durgapura			Pantnagar		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	BH1026	IVT-IR-MB-NWPZ-14	44.3	8	0	50.0	3	1	72.7	6	0	57.5	14	0	45.0	13	0
2	BH1027	IVT-IR-MB-NWPZ-6	44.6	7	0	39.5	13	0	64.2	15	0	58.2	12	0	55.3	5	0
3	BH1028	IVT-IR-MB-NWPZ-19	37.3	18	0	47.5	4	1	50.9	22	0	60.0	10	0	65.6	1	1
4	UPB1089	IVT-IR-MB-NWPZ-22	40.1	14	0	50.5	2	1	74.0	4	0	55.1	16	0	47.9	9	0
5	UPB1090	IVT-IR-MB-NWPZ-5	62.6	3	1	41.0	10	0	70.5	8	0	51.6	20	0	47.2	10	0
6	DWRB209	IVT-IR-MB-NWPZ-21	42.3	10	0	35.1	18	0	80.5	1	1	56.3	15	0	25.0	22	0
7	DWRB210	IVT-IR-MB-NWPZ-7	39.7	15	0	37.3	16	0	68.1	12	0	51.9	19	0	33.4	18	0
8	DWRB211	IVT-IR-MB-NWPZ-12	41.5	12	0	46.4	6	1	77.5	2	1	62.1	8	1	38.7	15	0
9	DWRB212	IVT-IR-MB-NWPZ-13	47.4	5	0	42.7	7	0	70.4	9	0	57.6	13	0	45.1	12	0
10	PL912	IVT-IR-MB-NWPZ-1	35.8	19	0	30.0	21	0	67.2	13	0	55.0	18	0	38.6	16	0
11	PL916	IVT-IR-MB-NWPZ-8	63.6	2	1	42.0	8	0	59.3	19	0	62.2	7	1	60.6	3	0
12	PL919	IVT-IR-MB-NWPZ-2	34.7	20	0	51.4	1	1	59.4	18	0	69.5	2	1	33.3	19	0
13	RD3023	IVT-IR-MB-NWPZ-11	41.8	11	0	32.5	20	0	68.4	11	0	55.1	17	0	28.2	20	0
14	RD3024	IVT-IR-MB-NWPZ-15	44.2	9	0	40.1	12	0	74.4	3	0	49.8	21	0	47.1	11	0
15	RD3025	IVT-IR-MB-NWPZ-9	34.1	21	0	28.6	22	0	62.4	16	0	46.6	22	0	26.3	21	0
16	RD3026	IVT-IR-MB-NWPZ-18	61.4	4	0	37.5	15	0	73.4	5	0	71.9	1	1	36.6	17	0
17	ABI Kranti	IVT-IR-MB-NWPZ-3	39.2	16	0	39.5	14	0	52.6	21	0	64.7	4	1	43.3	14	0
18	BH946(C)	IVT-IR-MB-NWPZ-16	46.3	6	0	47.0	5	1	65.9	14	0	68.2	3	1	51.7	8	0
19	DWRB101(C)	IVT-IR-MB-NWPZ-20	38.8	17	0	41.7	9	0	70.3	10	0	61.0	9	0	54.9	6	0
20	DWRB123(C)	IVT-IR-MB-NWPZ-4	66.8	1	1	35.0	19	0	59.6	17	0	62.8	6	1	53.7	7	0
21	RD2849 (C)	IVT-IR-MB-NWPZ-17	40.6	13	0	37.3	16	0	54.1	20	0	58.8	11	0	57.2	4	0
22	DWRB160(C)	IVT-IR-MB-NWPZ-10	34.0	22	0	40.2	11	0	70.7	7	0	63.4	5	1	61.6	2	0
		G.M.	**44.6**			**40.6**			**66.7**			**59.1**			**45.3**		
		S.E.(M)	1.8			2.0			1.9			3.7			0.9		
		C.D.	5.0			5.7			5.5			10.5			2.5		
		C.V.	8.0			9.9			5.8			12.5			3.8		
		DOS	15.11.2019			14.11.2019			18.11.2019			10.11.2019			11.11.2019		

Grain Yield Data (2019-20)

Trial: IVT-IR-MB **Zone: NWPZ**

SN	Varieties	Code No.	Bathinda			S G Nagar			Bawal			PAU Ludhiana			NWPZ		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	BH1026	IVT-IR-MB-NWPZ-14	68.0	13	0	73.6	14	0	67.4	5	1	65.7	3	0	**60.5**	**6**	**0**
2	BH1027	IVT-IR-MB-NWPZ-6	72.1	8	1	76.7	12	0	68.4	3	1	61.1	10	0	**60.0**	**9**	**0**
3	BH1028	IVT-IR-MB-NWPZ-19	72.4	7	1	83.3	8	0	59.0	13	0	61.2	8	0	**59.7**	**10**	**0**
4	UPB1089	IVT-IR-MB-NWPZ-22	70.7	9	0	91.8	2	1	67.7	4	1	63.4	5	0	**62.4**	**2**	**1**
5	UPB1090	IVT-IR-MB-NWPZ-5	76.0	1	1	86.6	5	0	68.6	2	1	64.0	4	0	**63.1**	**1**	**1**
6	DWRB209	IVT-IR-MB-NWPZ-21	62.0	21	0	77.9	11	0	58.2	15	0	45.9	21	0	**53.7**	**19**	**0**
7	DWRB210	IVT-IR-MB-NWPZ-7	60.4	22	0	69.9	16	0	55.7	17	0	62.0	7	0	**53.1**	**20**	**0**
8	DWRB211	IVT-IR-MB-NWPZ-12	73.8	6	1	60.0	21	0	53.7	19	0	45.9	22	0	**55.5**	**17**	**0**
9	DWRB212	IVT-IR-MB-NWPZ-13	63.8	18	0	71.7	15	0	52.6	21	0	51.4	17	0	**55.9**	**15**	**0**
10	PL912	IVT-IR-MB-NWPZ-1	63.2	19	0	55.4	22	0	69.3	1	1	59.3	11	0	**52.6**	**21**	**0**
11	PL916	IVT-IR-MB-NWPZ-8	62.2	20	0	83.7	7	0	60.1	12	0	55.7	15	0	**61.1**	**5**	**0**
12	PL919	IVT-IR-MB-NWPZ-2	66.2	16	0	61.9	20	0	53.7	18	0	57.6	13	0	**54.2**	**18**	**0**
13	RD3023	IVT-IR-MB-NWPZ-11	75.7	2	1	90.6	3	1	61.7	11	1	63.4	6	0	**57.5**	**13**	**0**
14	RD3024	IVT-IR-MB-NWPZ-15	75.4	3	1	67.4	17	0	62.0	10	1	57.5	14	0	**57.5**	**12**	**0**
15	RD3025	IVT-IR-MB-NWPZ-9	68.9	12	0	84.8	6	0	49.7	22	0	47.3	20	0	**49.9**	**22**	**0**
16	RD3026	IVT-IR-MB-NWPZ-18	66.2	15	0	94.3	1	1	63.4	8	1	48.7	18	0	**61.5**	**4**	**1**
17	ABI Kranti	IVT-IR-MB-NWPZ-3	69.0	11	0	80.9	9	0	63.2	9	1	61.1	9	0	**57.1**	**14**	**0**
18	BH946(C)	IVT-IR-MB-NWPZ-16	66.9	14	0	66.4	19	0	58.6	14	0	53.8	16	0	**58.3**	**11**	**0**
19	DWRB101(C)	IVT-IR-MB-NWPZ-20	75.3	4	1	74.3	13	0	65.3	6	1	59.3	11	0	**60.1**	**8**	**0**
20	DWRB123(C)	IVT-IR-MB-NWPZ-4	64.6	17	0	80.7	10	0	52.9	20	0	65.8	2	0	**60.2**	**7**	**0**
21	RD2849(C)	IVT-IR-MB-NWPZ-17	74.7	5	1	67.2	18	0	64.5	7	1	47.3	19	0	**55.8**	**16**	**0**
22	DWRB160(C)	IVT-IR-MB-NWPZ-10	70.1	10	0	88.0	4	0	56.8	16	0	74.3	1	1	**62.1**	**3**	**1**
		G.M.	**69.0**			**76.7**			**60.6**			**57.8**			**57.8**		
		S.E.(M)	1.7			1.4			3.0			2.2			**0.7**		
		C.D.	4.9			4.0			8.5			6.1			**1.7**		
		C.V.	5.1			3.7			10.0			7.5					
		DOS	20.11.2019			20.11.2019			18.11.2019			11.11.2019					

Ancillary Data of Barley Trial (2019-20)

Trial: IVT (Malt Barley) **ZONE: NWPZ**

SN	Varieties	Code No.	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			Disease reaction (Mean & HS)			
			H. days	M. days	PH (cm)	Tillering /m	Spike L (cm)	2/6 R	Colour	1000 g.w.	H/N	Rusts		Leaf Blight	
												YR*	LR	NB*\	SB*
1	BH1026	IVT-IR-MB-14	95 (75-105)	135 (120-151)	99 (84-112)	120 (99-148)	9.1 (8.1-10.0)	2	PY	56.0 (41-62)	H	-	-	12	13
2	BH1027	IVT-IR-MB-6	95 (76-107)	134 (120-151)	100 (86-119)	125 (93-194)	8.7 (7.8-10.0)	2	PY	55.3 (40-64)	H	-	-	23	34
3	BH1028	IVT-IR-MB-19	95 (79-112)	136 (121-155)	104 (89-115)	151 (90-336)	8.0 (6.3-9.2)	2	PY	56.0 (40-68)	H	-	-	13	12
4	UPB1089	IVT-IR-MB-22	95 (78-105)	134 (119-149)	101 (85-114)	129 (100-153)	6.6 (6.0-8.6)	2	PY	48.7 (40-55)	H	-	-	13	24
5	UPB1090	IVT-IR-MB-5	96 (81-103)	135 (120-153)	100 (76-111)	119 (90-193)	6.9 (6.1-8.0)	2	PY	54.0 (43-59)	H	-	-	12	13
6	DWRB209	IVT-IR-MB-21	87 (68-105)	131 (114-147)	97 (86-110)	115 (86-167)	7.4 (6.4-9.0)	2	PY	50.0 (38-57)	H	-	-	13	36
7	DWRB210	IVT-IR-MB-7	93 (72-102)	133 (118-149)	99 (88-113)	99 (76-130)	7.1 (6.1-9.2)	2	PY	58.7 (42-68)	H	-	-	24	35
8	DWRB211	IVT-IR-MB-12	93 (83-102)	133 (121-147)	97 (84-107)	119 (93-162)	8.6 (7.0-10.5)	2	PY	50.7 (39-58)	H	-	-	12	13
9	DWRB212	IVT-IR-MB-13	95 (75-107)	135 (120-149)	92 (82-101)	105 (76-139)	8.2 (7.5-9.2)	2	PY	51.9 (37-56)	H	-	-	12	24
10	PL912	IVT-IR-MB-1	94 (74-106)	135 (118-149)	106 (88-124)	101 (74-115)	8.5 (7.5-10.0)	2	PY	54.7 (38-68)	H	-	-	13	12
11	PL916	IVT-IR-MB-8	99 (81-112)	138 (125-151)	97 (75-109)	125 (96-159)	8.8 (7.5-10.5)	2	PY	49.2 (42-56)	H	-	-	12	24

** Net blotch and Spot blotch data from Hisar centre only*

Ancillary Data of Barley Trial (2019-20)

Trial: IVT (Malt Barley) **ZONE: NWPZ**

SN	Varieties	Code No.	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			Disease reaction (Mean & HS)			
			H. days	M. days	PH (cm)	Tillering /m	Spike L (cm)	2/6 R	Colour	1000 g.w (M & Range)	H/ N	Rusts		Leaf Blight	
												YR*	L R	NB*	SB*
12	PL919	IVT-IR-MB-2	99 (82-112)	138 (127-151)	99 (87-114)	138 (92-235)	8.7 (7.7-9.1)	2	PY	50.2 (39-56)	H	-	-	12	13
13	RD3023	IVT-IR-MB-11	91 (70-101)	132 (116-147)	97 (87-106)	111 (78-159)	8.3 (6.8-9.3)	2	PY	57.1 (41-68)	H	-	-	13	23
14	RD3024	IVT-IR-MB-15	89 (69-104)	132 (118-149)	100 (84-109)	123 (103-170)	7.0 (6.6-7.7)	2	PY	54.3 (40-60)	H	-	-	12	23
15	RD3025	IVT-IR-MB-9	92 (69-103)	132 (116-148)	102 (87-116)	116 (88-167)	9.2 (7.2-12.0)	2	PY	49.7 (42-59)	H	-	-	12	13
16	RD3026	IVT-IR-MB-18	88 (68-108)	132 (116-150)	97 (72-113)	133 (74-269)	8.0 (7.0-9.0)	2	PY	51.6 (42-62)	H	-	-	13	24
17	ABI Kranti	IVT-IR-MB-3	99 (74-113)	136 (116-149)	98 (89-111)	135 (96-202)	8.6 (7.3-9.6)	2	PY	43.8 (38-54)	H	-	-	12	23
18	BH946(C)	IVT-IR-MB-16	94 (71-112)	135 (117-155)	101 (89-112)	108 (75-143)	7.8 (6.8-9.3)	6	PY	44.7 (39-52)	H	-	-	12	13
19	DWRB101(C)	IVT-IR-MB-20	94 (72-110)	134 (115-147)	97 (86-111)	128 (92-224)	8.4 (7.2-9.6)	2	PY	49.3 (40-58)	H	-	-	12	13
20	DWRB123(C)	IVT-IR-MB-4	93 (74-105)	134 (120-149)	96 (86-107)	106 (93-147)	7.8 (7.0-8.6)	2	PY	51.8 (39-57)	H	-	-	12	23
21	RD2849(C)	IVT-IR-MB-17	93 (74-105)	135 (119-149)	97 (82-111)	142 (92-278)	7.3 (6.5-8.0)	2	PY	47.2 (37-56)	H	-	-	14	25
22	DWRB160(C)	IVT-IR-MB-10	93 (73-103)	134 (118-151)	102 (87-116)	107 (80-137)	8.9 (6.5-10.2)	2	PY	63.2 (45-76)	H	-	-	23	24

** Net blotch and Spot blotch data from Hisar centre only*

ADVANCE VARIETAL TRIAL (IRRIGATED) FEED BARLEY-NWPZ

The AVT feed barley was proposed at 8 locations comprising in NWPZ. The trial was conducted at all locations. The results from all the eight locations were included for zonal compilation.

The trial consisted of four entries and four checks, namely BH946, RD 2552, BH902 and DWRB137. The trial was monitored during the crop season in NWPZ (Hisar, Ludhiana, Durgapura, Tabiji and Udaipur) by the zonal monitoring team. All the entries at all the locations were observed to be genetically pure.

No incidence of diseases and insects-pests was reported from any of the locations visited by the monitoring team. However, moderate levels of leaf blight were recorded at Hisar locations in all the entries.

In case of grain yield, in NWPZ, the check BH946 ranked first with 49.6 q/ha mean grain yield followed by the remaining seven entries/checks, UPB1080 (49.3 q/ha), PL906 (48.7 q/ha), RD2552 (48.6 q/ha), RD2994 (48.4 q/ha), KB1707 (48.4 q/ha), BH902 (47.8 q/ha) and DWRB137 (47.7 q/ha) in the first non-significant group.

Grain Yield Data (2019-20)

Trial: AVT-IR-TS-FB **Zone: NWPZ**

SN	Entry	Code	HAU, Hisar			Udaipur			Modipuram			Pantnagar			Durgapura		
			Yield q/ha	Rk	G	Yield q/ha	Rk	G	Yield q/ha	Rk	G	Yield q/ha	Rk	G	Yield q/ha	Rk	G
1	KB1707	AVT-IRFB-E8	44.9	8	1	52.0	2	1	54.8	4	1	42.9	1	1	46.8	7	1
2	RD2994	AVT-IRFB-E2	48.3	3	1	47.1	4	1	54.9	3	1	34.9	8	0	52.5	3	1
3	UPB1080	AVT-IRFB-E7	46.6	4	1	50.2	3	1	54.2	5	1	41.5	2	1	45.4	8	1
4	PL906	AVT-IRFB-E4	45.3	6	1	44.2	6	1	51.2	7	1	37.6	4	1	55.4	1	1
5	BH946 (C)	AVT-IRFB-E1	45.6	5	1	54.0	1	1	57.9	1	1	34.9	7	0	52.3	5	1
6	RD2552 (C)	AVT-IRFB-E6	49.1	2	1	43.6	7	1	51.5	6	1	39.4	3	1	52.4	4	1
7	BH902 (C)	AVT-IRFB-E5	45.3	7	1	36.0	8	0	50.7	8	1	35.6	5	0	53.0	2	1
8	DWRB137(C)	AVT-IRFB-E3	50.3	1	1	44.9	5	1	57.4	2	1	35.4	6	0	51.0	6	1
		G.M.	**46.9**			**46.5**			**54.1**			**37.8**			**51.1**		
		S.E.(M)	4.7			5.2			3.3			2.6			4.6		
		C.D.	11.7			13.0			8.2			6.6			11.4		
		C.V.	17.4			19.5			10.5			12.1			15.4		
		DOS	13.11.2019			25.11.2019			11.11.2019			11.11.2019			10.11.2019		

Grain Yield Data (2019-20) **Trial: AVT-IR-TS-FB** **Zone: NWPZ**

SN	Entry	Code	Tabiji			Karnal			Ludhiana			NWPZ		
			Yield q/ha	Rk	G	Yield q/ha	Rk	G	Yield q/ha	Rk	G	Yield q/ha	Rk	G
1	KB1707	AVT-IRFB-E8	67.9	5	1	30.8	8	1	47.2	8	1	**48.4**	6	1
2	RD2994	AVT-IRFB-E2	70.2	3	1	31.0	7	1	48.4	6	1	**48.4**	5	1
3	UPB1080	AVT-IRFB-E7	75.1	1	1	32.3	5	1	48.6	5	1	**49.3**	2	1
4	PL906	AVT-IRFB-E4	67.4	6	1	40.0	1	1	48.8	4	1	**48.7**	3	1
5	BH946 (C)	AVT-IRFB-E1	64.2	7	1	37.9	2	1	49.8	3	1	**49.6**	1	1
6	RD2552 (C)	AVT-IRFB-E6	70.4	2	1	32.0	6	1	50.2	2	1	**48.6**	4	1
7	BH902 (C)	AVT-IRFB-E5	69.3	4	1	37.8	3	1	54.6	1	1	**47.8**	7	1
8	DWRB137(C)	AVT-IRFB-E3	61.2	8	0	33.5	4	1	48.1	7	1	**47.7**	8	1
		G.M.	**68.2**			**34.4**			**49.5**			**48.6**		
		S.E.(M)	5.4			4.0			3.7			**1.5**		
		C.D.	13.4			9.9			9.3			**3.6**		
		C.V.	13.7			20.0			13.1					
		DOS	15.11.2019			15.11.2019			11.11.2019					

Summary of ancillary data (Rabi 2019-20)

AVT–IR-FB **ZONE: NWPZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			DISEASE REACTION		
			H. days	M. days	Height (cm)	Tillering per meter	SL (cm)	2/6 Row	Color	1000 g.w (g)	H/N	Rust		Leaf Blight
												YR	LR	
1	KB1707	AVT-IRFB-E8	90 (80-102)	135 (124-150)	140 (125-171)	104 (82-130)		6R	LY	45 (37-53)	H			34
2	RD2994	AVT-IRFB-E2	82 (65-95)	127 (107-148)	111 (93-138)	104 (96-112)		6R	LY	48 (38-56)	H			34
3	UPB1080	AVT-IRFB-E7	84 (65-98)	132 (115-155)	122 (90-144)	104 (98-115)		6R	LY	39 (29-43)	H			36
4	PL906	AVT-IRFB-E4	85 (72-99)	134 (118-151)	142 (104-207)	104 (95-111)		6R	LY	44 (31-54)	H			23
5	BH946 (C)	AVT-IRFB-E1	86 (69-100)	128 (115-149)	127 (94-177)	104 (98-121)		6R	LY	44 (35-55)	H			24
6	RD2552 (C)	AVT-IRFB-E6	89 (74-101)	133 (121-157)	162 (112-288)	97 (86-110)		6R	LY	40 (31-47)	H			34
7	BH902 (C)	AVT-IRFB-E5	88 (77-101)	132 (123-147)	153 (106-290)	111 (98-122)		6R	LY	45 (34-55)	H			35
8	DWRB137(C)	AVT-IRFB-E3	82 (66-97)	126 (103-155)	125 (96-146)	93 (77-105)		6R	LY	44 (37-52)	H			24

INITIAL VARIETAL TRIAL (IRRIGATED) FEED BARLEY

The IVT feed barley was proposed at 18 locations comprising of NWPZ (7), NEPZ (7) and Central Zone (4) in northern plains. The trial was conducted at all locations. The results from all the seven locations were included for zonal compilation in NWPZ. In case of NEPZ, six locations were included in zonal means as the data from Kalyani (low yield levels) were rejected. Similarly, in central zone data were reported from all the four centres.

The trial consisted of 20 entries and five checks, namely BH946, RD2552, DWRB137, RD2899 and BH902. The trial was monitored during the crop season in NWPZ (Tabiji, Hisar, Ludhiana and Durgapura), NEPZ (Ranchi, CAU-Pusa, Sabour, Kanpur, Faizabad and Varanasi) and Central Zone (Gwalior, Morena, Udaipur and Vijapur) by the zonal monitoring teams. Entries RD3014 and BH1031 were observed as segregating/ mixtures up to a considerable level; while nine entries namely, KB1816, KB1817, KB1822, NDB1738, BH1030, RD3013, PL917, PL920 and check BH902 were having off types and need purifications, based on NWPZ, NEPZ and Central Zone observations.

In NWPZ, incidence of aphid was noticed in checks and entries at many centres. In case of NEPZ, also leaf blights of very high levels were recorded in entries RD2830, RD2831 and RD2833, while rest of the entries had moderate levels of LB incidence.

In case of grain yield, in NWPZ, check DWRB137 ranked first with 55.0 q/ha mean grain yield followed by entry HUB272 (54.9 q/ha) in the first non-significant group. In NEPZ, check RD2899 (45.7 q/ha) ranked first and was followed by RD3011 (45.4 q/ha), BH946 (44.3 q/ha) and KB1822 (43.6 q/ha) respectively, in the first NSG. In case of central zone check the entry UPB1088 (55.2 q/ha) ranked first and was followed by nine more entries in the first non-significant group.

On national basis check DWRB137 (50.0 q/ha) ranked first followed by check RD2899 (49.9 q/ha) and entry RD3011 (48.3 q/ha) in first Non-Significant Group.

Grain Yield Data (2019-20)

Trial: IVT-IR-TS-FB **Zone: NWPZ**

SN	Entry	Code	Hisar			Modipuram			Durgapura			Karnal			Ludhiana			Pantnagar			Tabiji			NWPZ		
			Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	Rk	G
1	KB1816	IVT-IRFB-E6	42.7	16	0	62.7	6	0	50.7	16	0	29.4	20	0	44.2	4	1	37.6	13	0	76.5	3	1	**49.1**	6	0
2	KB1817	IVT-IRFB-E23	46.5	13	0	50.2	20	0	39.7	21	0	24.8	24	0	30.7	24	0	27.8	23	0	50.1	20	0	**38.5**	24	0
3	KB1822	IVT-IRFB-E5	46.8	12	0	50.7	19	0	59.4	8	0	32.7	16	0	41.3	9	1	24.6	25	0	76.8	1	1	**47.5**	12	0
4	HUB271	IVT-IRFB-E16	46.8	11	0	43.2	25	0	41.2	20	0	37.7	7	1	29.0	25	0	26.5	24	0	65.0	9	0	**41.3**	21	0
5	HUB272	IVT-IRFB-E25	41.7	18	0	52.5	14	0	68.8	1	1	60.6	1	1	42.0	8	1	57.4	1	1	61.4	12	0	**54.9**	2	1
6	NDB1738	IVT-IRFB-E4	33.2	25	0	52.4	15	0	31.4	25	0	25.5	23	0	36.2	19	0	35.4	15	0	54.5	17	0	**38.4**	25	0
7	BH1029	IVT-IRFB-E14	50.2	6	1	56.8	11	0	52.1	13	0	35.4	12	1	45.7	3	1	38.1	11	0	48.7	21	0	**46.7**	13	0
8	BH1030	IVT-IRFB-E24	50.0	7	1	57.2	10	0	55.8	10	0	42.3	3	1	39.9	11	0	35.1	18	0	53.9	18	0	**47.7**	10	0
9	BH1031	IVT-IRFB-E22	51.9	4	1	47.9	21	0	56.9	9	0	37.5	8	1	39.9	14	0	34.5	19	0	64.6	10	0	**47.6**	11	0
10	RD3011	IVT-IRFB-E3	52.8	2	1	52.8	13	0	52.1	13	0	39.2	5	1	33.3	23	0	40.6	7	0	69.5	5	1	**48.6**	7	0
11	RD3012	IVT-IRFB-E19	40.4	21	0	69.1	1	1	39.4	22	0	34.9	13	1	37.7	16	0	48.0	3	0	45.9	23	0	**45.1**	16	0
12	RD3013	IVT-IRFB-E11	48.5	8	1	62.4	7	0	43.6	18	0	33.0	15	0	42.1	6	1	38.8	9	0	45.0	24	0	**44.8**	18	0
13	RD3014	IVT-IRFB-E2	51.8	5	1	47.2	22	0	61.6	4	1	41.5	4	1	48.6	1	1	33.3	22	0	67.1	6	1	**50.1**	4	0
14	UPB1087	IVT-IRFB-E13	40.6	20	0	46.9	23	0	36.1	24	0	27.4	22	0	37.7	16	0	33.5	21	0	57.1	15	0	**39.9**	23	0
15	UPB1088	IVT-IRFB-E7	42.1	17	0	57.7	8	0	51.7	15	0	37.0	9	1	39.9	13	0	38.0	12	0	47.3	22	0	**44.8**	17	0
16	PL911	IVT-IRFB-E15	45.0	14	0	57.5	9	0	38.6	23	0	29.3	21	0	47.8	2	1	42.0	5	0	76.7	2	1	**48.2**	9	0
17	PL915	IVT-IRFB-E1	39.8	22	0	51.9	16	0	53.0	12	0	24.3	25	0	43.5	5	1	39.0	8	0	64.5	11	0	**45.1**	15	0
18	PL917	IVT-IRFB-E10	47.0	10	0	51.9	16	0	63.5	2	1	32.3	17	0	35.5	22	0	34.5	20	0	74.2	4	1	**48.4**	8	0
19	PL920	IVT-IRFB-E21	39.0	23	0	51.4	18	0	50.5	17	0	31.1	19	0	40.6	10	1	35.3	16	0	36.2	25	0	**40.6**	22	0
20	DWRB215	IVT-IRFB-E17	37.3	24	0	64.0	3	0	42.9	19	0	31.1	18	0	37.0	18	0	36.0	14	0	59.9	13	0	**44.0**	19	0
21	BH 946 (C)	IVT-IRFB-E8	48.0	9	1	64.0	3	0	60.1	7	0	36.7	10	1	36.2	19	0	38.1	10	0	66.8	8	1	**50.0**	5	0
22	RD2552 (C)	IVT-IRFB-E12	43.6	15	0	56.0	12	0	60.6	5	0	35.9	11	1	39.2	15	0	35.3	17	0	55.8	16	0	**46.6**	14	0
23	DWRB137(C)	IVT-IRFB-E18	53.4	1	1	64.0	3	0	63.1	3	1	46.4	2	1	39.9	11	0	51.6	2	0	66.9	7	1	**55.0**	1	1
24	RD2899(C)	IVT-IRFB-E20	52.4	3	1	65.6	2	1	60.4	6	0	38.3	6	1	42.1	7	1	45.6	4	0	57.4	14	0	**51.7**	3	0
25	BH902(C)	IVT-IRFB-E9	41.4	19	0	45.2	24	0	53.3	11	0	33.1	14	0	36.2	19	0	41.1	6	0	53.2	19	0	**43.4**	20	0
		Mean	**45.3**			**55.3**			**51.4**			**35.1**			**39.4**			**37.9**			**59.8**			46.3		
		S.E.M	2.3			2.2			3.5			3.4			3.5			0.6			4.8			**1.2**		
		C.D.	5.7			5.2			8.3			8.3			8.4			1.5			11.6			**2.8**		
		C.V.	7.2			5.5			9.5			13.9			12.5			2.2			11.4					
		D.O.S.	14.11.2019			13.11.19			10.11.2019			15.11.19			12.11.2019			11.11.2019			15.11.19					

Grain Yield Data (2019-20)

Trial: IVT-IR-TS-FB **Zone: NEPZ**

SN	Entry	Code	Ranchi			Kanpur			Faizabad			Varanasi			CAU Pusa			Sabour			NEPZ		
			Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G
1	KB1816	IVT-IRFB-E6	46.7	15	0	45.3	10	0	33.2	14	0	42.1	18	0	33.0	12	0	38.8	9	0	**39.9**	16	0
2	KB1817	IVT-IRFB-E23	65.2	3	1	43.5	12	0	33.8	9	0	35.0	23	0	31.7	20	0	36.2	14	0	**40.9**	14	0
3	KB1822	IVT-IRFB-E5	50.0	10	0	48.9	5	0	34.0	7	0	50.7	7	0	32.2	17	0	45.7	3	1	**43.6**	4	1
4	HUB271	IVT-IRFB-E16	47.8	14	0	41.7	18	0	34.6	6	0	42.3	17	0	33.2	11	0	41.3	7	0	**40.1**	15	0
5	HUB272	IVT-IRFB-E25	58.7	5	1	48.9	5	0	33.4	13	0	30.2	25	0	30.8	22	0	46.6	2	1	**41.4**	11	0
6	NDB1738	IVT-IRFB-E4	38.0	22	0	23.6	25	0	32.8	19	0	48.9	9	0	29.7	25	0	28.4	22	0	**33.6**	25	0
7	BH1029	IVT-IRFB-E14	50.0	10	0	45.3	11	0	37.9	4	0	48.9	9	0	36.6	5	1	39.3	8	0	**43.0**	5	0
8	BH1030	IVT-IRFB-E24	50.0	10	0	52.5	3	0	30.3	24	0	34.3	24	0	32.6	14	0	21.3	24	0	**36.8**	22	0
9	BH1031	IVT-IRFB-E22	43.5	17	0	36.2	22	0	32.2	20	0	36.8	21	0	33.0	12	0	31.3	20	0	**35.5**	23	0
10	RD3011	IVT-IRFB-E3	56.5	6	0	63.4	1	1	31.5	21	0	47.1	11	0	31.7	21	0	42.0	5	0	**45.4**	2	1
11	RD3012	IVT-IRFB-E19	51.1	9	0	50.7	4	0	39.6	2	1	45.9	14	0	35.1	9	0	28.8	21	0	**41.9**	9	0
12	RD3013	IVT-IRFB-E11	43.5	17	0	38.0	21	0	33.1	17	0	46.5	12	0	33.7	10	0	38.1	11	0	**38.8**	20	0
13	RD3014	IVT-IRFB-E2	46.7	15	0	43.5	12	0	33.6	11	0	53.1	6	0	39.5	1	1	33.6	16	0	**41.7**	10	0
14	UPB1087	IVT-IRFB-E13	42.4	20	0	47.1	9	0	38.4	3	0	50.7	8	0	38.8	2	1	21.0	25	0	**39.7**	17	0
15	UPB1088	IVT-IRFB-E7	55.4	7	0	34.4	23	0	40.7	1	1	54.3	3	0	30.8	22	0	31.9	19	0	**41.3**	13	0
16	PL911	IVT-IRFB-E15	48.9	13	0	43.5	12	0	25.5	25	0	58.6	2	0	36.6	5	1	44.0	4	1	**42.9**	6	0
17	PL915	IVT-IRFB-E1	33.7	24	0	34.4	23	0	33.1	15	0	38.2	20	0	32.2	17	0	32.9	17	0	**34.1**	24	0
18	PL917	IVT-IRFB-E10	68.5	1	1	38.0	19	0	33.6	10	0	44.1	16	0	36.2	7	1	32.5	18	0	**42.2**	7	0
19	PL920	IVT-IRFB-E21	55.4	7	0	38.0	19	0	30.4	23	0	45.9	14	0	30.8	22	0	36.3	13	0	**39.5**	18	0
20	DWRB215	IVT-IRFB-E17	35.9	23	0	47.1	8	0	33.9	8	0	41.7	19	0	32.6	14	0	41.9	6	0	**38.9**	19	0
21	BH 946 (C)	IVT-IRFB-E8	60.9	4	1	54.7	2	1	33.6	12	0	46.5	12	0	36.1	8	1	34.1	15	0	**44.3**	3	1
22	RD2552 (C)	IVT-IRFB-E12	43.5	17	0	48.9	5	0	33.1	16	0	35.6	22	0	31.9	19	0	28.2	23	0	**36.9**	21	0
23	DWRB137(C)	IVT-IRFB-E18	39.1	21	0	43.5	12	0	30.6	22	0	65.2	1	1	32.6	14	0	36.9	12	0	**41.3**	12	0
24	RD2899(C)	IVT-IRFB-E20	68.5	1	1	43.5	12	0	32.8	18	0	53.7	5	0	37.0	4	1	38.8	10	0	**45.7**	1	1
25	BH902(C)	IVT-IRFB-E9	31.5	25	0	43.5	12	0	37.3	5	0	54.3	3	0	38.0	3	1	46.7	1	1	**41.9**	8	0
		Mean	**49.3**			**43.9**			**33.7**			**46.0**			**33.9**			**35.9**			**40.4**		
		S.E.M	3.5			3.6			0.5			1.6			1.6			1.8			1.0		
		C.D.	8.4			8.6			1.2			3.9			3.8			4.4			2.3		
		C.V.	9.9			11.5			2.1			5.0			6.5			7.1					
		D.O.S.	22.11.2019			30.11.2019			15.11.2019			18.11.2019			20.11.2019			08.11.2019					

Grain Yield Data (2019-20)

Trial: IVT-IR-TS-FB **Zone: CZ**

SN	Entry	Code	Vijapur			Udaipur			Gwalior			Morena			CZ			Over All		
			Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G	Yield	RK	G
1	KB1816	IVT-IRFB-E6	46.7	6	0	44.3	18	0	66.9	4	1	40.2	20	0	**49.5**	12	0	**45.9**	11	0
2	KB1817	IVT-IRFB-E23	25.4	25	0	53.6	5	1	61.3	13	1	40.0	21	0	**45.1**	23	0	**40.9**	24	0
3	KB1822	IVT-IRFB-E5	43.0	11	0	55.1	4	1	64.0	10	1	56.8	3	1	**54.7**	2	1	**47.8**	4	0
4	HUB271	IVT-IRFB-E16	43.5	9	0	32.1	25	0	59.0	18	1	38.5	23	0	**43.3**	25	0	**41.4**	23	0
5	HUB272	IVT-IRFB-E25	29.7	22	0	44.9	17	0	61.0	14	1	43.0	17	0	**44.6**	24	0	**47.7**	5	0
6	NDB1738	IVT-IRFB-E4	28.4	24	0	46.3	15	0	64.9	6	1	46.3	16	1	**46.5**	20	0	**38.6**	25	0
7	BH1029	IVT-IRFB-E14	41.2	15	0	55.6	2	1	64.4	8	1	54.2	8	1	**53.8**	5	1	**47.1**	8	0
8	BH1030	IVT-IRFB-E24	40.5	17	0	46.7	14	0	55.0	24	0	54.2	9	1	**49.1**	13	0	**44.2**	16	0
9	BH1031	IVT-IRFB-E22	36.6	20	0	39.4	22	0	50.7	25	0	54.4	6	1	**45.3**	22	0	**42.8**	19	0
10	RD3011	IVT-IRFB-E3	49.5	2	0	48.6	11	0	64.0	9	1	47.2	15	1	**52.4**	8	1	**48.3**	3	1
11	RD3012	IVT-IRFB-E19	42.5	13	0	53.6	7	1	71.0	1	1	41.5	19	0	**52.1**	9	1	**45.6**	12	0
12	RD3013	IVT-IRFB-E11	42.8	12	0	59.3	1	1	60.4	16	1	55.0	4	1	**54.4**	3	1	**44.9**	15	0
13	RD3014	IVT-IRFB-E2	40.5	18	0	45.8	16	0	60.2	17	1	57.7	2	1	**51.1**	11	1	**47.4**	7	0
14	UPB1087	IVT-IRFB-E13	47.4	5	0	35.2	24	0	64.4	7	1	41.8	18	0	**47.2**	18	0	**41.5**	22	0
15	UPB1088	IVT-IRFB-E7	61.2	1	1	42.4	21	0	56.9	21	0	60.5	1	1	**55.2**	1	1	**46.0**	10	0
16	PL911	IVT-IRFB-E15	35.0	21	0	48.3	12	0	55.2	23	0	54.3	7	1	**48.2**	15	0	**46.3**	9	0
17	PL915	IVT-IRFB-E1	45.4	7	0	44.0	19	0	61.5	11	1	36.1	25	0	**46.8**	19	0	**41.6**	21	0
18	PL917	IVT-IRFB-E10	29.1	23	0	55.3	3	1	57.2	20	0	39.6	22	0	**45.3**	21	0	**45.5**	13	0
19	PL920	IVT-IRFB-E21	37.0	19	0	48.8	10	0	55.3	22	0	47.8	14	1	**47.3**	17	0	**41.8**	20	0
20	DWRB215	IVT-IRFB-E17	49.1	3	0	39.4	23	0	68.2	3	1	49.2	13	1	**51.5**	10	1	**44.0**	17	0
21	BH 946 (C)	IVT-IRFB-E8	42.1	14	0	43.6	20	0	68.6	2	1	36.6	24	0	**47.7**	16	0	**47.5**	6	0
22	RD2552 (C)	IVT-IRFB-E12	40.6	16	0	47.7	13	0	58.0	19	0	49.4	12	1	**48.9**	14	0	**43.7**	18	0
23	DWRB137(C)	IVT-IRFB-E18	43.4	10	0	53.5	8	1	66.7	5	1	53.5	10	1	**54.3**	4	1	**50.0**	1	1
24	RD2899(C)	IVT-IRFB-E20	48.3	4	0	51.3	9	1	61.3	12	1	50.7	11	1	**52.9**	7	1	**49.9**	2	1
25	BH902(C)	IVT-IRFB-E9	43.8	8	0	53.6	6	1	60.7	15	1	54.6	5	1	**53.2**	6	1	**45.1**	14	0
		Mean	**41.3**			**47.5**			**61.5**			**48.1**			**49.6**			**45.0**		
		S.E.M	2.9			3.5			4.9			6.5			**2.3**			**0.8**		
		C.D.	7.2			8.5			12.0			16.0			**5.4**			**1.9**		
		C.V.	9.9			10.3			11.2			19.0								
		D.O.S.	07.11.2019			25.11.2019			18.11.2019			21.11.2019								

Summary of ancillary and disease data (Rabi 2019-20)

IVT-IR-TS- FB **ZONE: NWPZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			DISEASE REACTION		
			H. days	M. days	Height (cm)	Tillering per meter	SL	2/6 Row	Colour	1000 g.w (g)	H/N	Rust		Leaf Blight
												YR	LR	
1	KB1816	IVT-IRFB-E6	88 (72-100)	131 (116-149)	103 (87-116)	125 (96-173)		6R		37 (28-45)	H			24
2	KB1817	IVT-IRFB-E23	89 (72-102)	132 (118-147)	105 (92-116)	123 (100-182)		6R		39 (35-48)	H			34
3	KB1822	IVT-IRFB-E5	95 (74-106)	129 (117-151)	102 (90-117)	150 (95-262)		6R		41 (34-49)	H			23
4	HUB271	IVT-IRFB-E16	89 (70-104)	129 (116-143)	107 (95-123)	111 (74-153)		6R		44 (35-52)	H			34
5	HUN272	IVT-IRFB-E25	89 (71-100)	133 (123-149)	104 (100-111)	124 (76-203)		6R		38 (27-50)	H			24
6	NDB1738	IVT-IRFB-E4	85 (70-97)	136 (120-154)	103 (95-120)	133 (86-209)		6R		39 (34-47)	H			34
7	BH1029	IVT-IRFB-E14	92 (79-101)	132 (118-149)	102 (97-107)	113 (84-150)		6R		40 (33-48)	H			24
8	BH1030	IVT-IRFB-E24	91 (76-99)	133 (120-150)	104 (94-126)	130 (96-210)		6R		45 (39-53)	H			35
9	BH1031	IVT-IRFB-E22	90 (72-101)	135 (124-152)	108 (99-113)	141 (98-244)		6R		43 (34-53)	H			13
10	RD3011	IVT-IRFB-E3	89 (72-101)	131 (119-146)	102 (94-112)	147 (92-292)		6R		43 (35-54)	H			14
11	RD3012	IVT-IRFB-E19	83 (67-96)	132 (116-148)	99 (88-110)	103 (98-110)		6R		39 (34-45)	H			24
12	RD3013	IVT-IRFB-E11	91 (71-104)	130 (111-150)	93 (83-104)	131 (108-180)		6R		37 (31-44)	H			13
13	RD3014	IVT-IRFB-E2	89 (69-101)	132 (119-147)	100 (93-112)	126 (88-218)		6R		44 (39-48)	H			24
14	UPB1087	IVT-IRFB-E13	91 (76-101)	135 (126-151)	112 (94-132)	117 (105-132)		6R		41 (33-48)	H			13
15	UPB1088	IVT-IRFB-E7	84 (66-98)	134 (122-150)	105 (96-116)	111 (80-163)		6R		43 (37-47)	H			13
16	PL911	IVT-IRFB-E15	88 (70-98)	133 (119-153)	103 (94-117)	115 (90-177)		6R		39 (30-48)	H			23
17	PL915	IVT-IRFB-E1	120 (112-126)	130 (119-147)	102 (91-114)	149 (80-232)		6R		36 (31-42)	H			13
18	PL917	IVT-IRFB-E10	92 (77-102)	132 (118-154)	108 (100-120)	145 (100-230)		6R		43 (37-50)	H			24
19	PL920	IVT-IRFB-E21	91 (74-102)	131 (118-147)	103 (92-123)	153 (104-257)		6R		47 (36-56)	H			36
20	DWRB215	IVT-IRFB-E17	83 (66-97)	129 (119-147)	91 (81-100)	103 (79-137)		6R		42 (35-47)	H			45
21	BH 946 (C)	IVT-IRFB-E8	87 (70-99)	129 (113-149)	100 (75-113)	126 (99-167)		6R		44 (38-52)	H			25
22	RD2552 (C)	IVT-IRFB-E12	85 (69-98)	135 (125-147)	102 (91-123)	144 (110-240)		6R		39 (32-46)	H			34
23	DWRB137(C)	IVT-IRFB-E18	84 (68-92)	127 (108-147)	95 (75-120)	125 (104-171)		6R		48 (44-55)	H			35
24	RD2899 (C)	IVT-IRFB-E20	88 (71-100)	133 (122-154)	100 (97-105)	177 (112-370)		6R		46 (34-56)	H			35
25	BH902 (C)	IVT-IRFB-E9	87 (69-100)	138 (124-155)	100 (92-105)	133 (97-222)		6R		44 (32-54)	H			13

Summary of ancillary and disease data (Rabi 2019-20)

IVT-IR-TS- FB **ZONE: NEPZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean& Range)						GRAIN CHARACTERISTICS			DISEASE REACTION		
			H. days	M. days	Height (cm)	Tillering per meter	SL (cm)	2/6 Row	Colour	1000 g.w (g)	H/N	Rust		Leaf Blight
												YR	LR	
1	KB1816	IVT-IRFB-E6	75(64-93)	115 (93-134)	90 (74-118)	125 (96-173)	-	6R	-	39(32-48)	H	0	-	68
2	KB1817	IVT-IRFB-E23	84 (78-88)	121(113-125)	95 (79-113)	123(100-182)	-	6R	-	40 (32-48)	H	0.1	-	46
3	KB1822	IVT-IRFB-E5	80 (74-85)	118 (103-129)	92 (85-103)	150(95-262)	-	6R	-	41 (34-49)	H	0.1	-	67
4	HUB271	IVT-IRFB-E16	75 (64-91)	116(92-132)	97 (78-108)	111 (74-153)	-	6R	-	42 (34-49)	H	0	-	35
5	HUb272	IVT-IRFB-E25	77 (67-86)	115(98-123)	97 (80-109)	124 (76-203)	-	6R	-	41 (34-48)	H	0	-	35
6	NDB1738	IVT-IRFB-E4	84(73-88)	118(95-127)	97(82-116)	133(86-209)	-	6R	-	40 (36-46)	H	0.1	-	35
7	BH1029	IVT-IRFB-E14	82 (75-87)	119 (106-125)	97 (84-114)	113 (84-150)	-	6R	-	41 (36-48)	H	0.1	-	35
8	BH1030	IVT-IRFB-E24	82 (76-87)	119 (106-127)	94 (76-103)	130 (96-210)	-	6R	-	41 (32-48)	H	0	-	68
9	BH1031	IVT-IRFB-E22	81 (73-94)	119 (102-135)	105 (98-113)	141 (98-244)	-	6R	-	41 (35-50)	H	0	-	57
10	RD3011	IVT-IRFB-E3	75 (62-86)	114 (92-125)	93 (78-98)	147 (92-292)	-	6R	-	41 (32-48)	H	0	-	35
11	RD3012	IVT-IRFB-E19	78 (68-90)	117 (100-130)	93 (66-100)	103 (98-110)	-	6R	-	40 (34-48)	H	0	-	68
12	RD3013	IVT-IRFB-E11	80 (73-90)	118 (102-130)	89 (75-109)	131 (108-180)	-	6R	-	40 (34-52)	H	0	-	46
13	RD3014	IVT-IRFB-E2	80 (70-91)	118 (100-130)	90 (72-100)	126 (88-218)	-	6R	-	42 (35-48)	H	0	-	57
14	UPB1087	IVT-IRFB-E13	83 (77-91)	120 (107-132)	106 (86-113)	117 (105-132)	-	6R	-	39 (32-44)	H	0	-	35
15	UPB1088	IVT-IRFB-E7	81 (72-93)	118 (101-134)	97 (71-108)	111 (80-163)	-	6R	-	41 (34-50)	H	0	-	57
16	PL911	IVT-IRFB-E15	81 (72-89)	117 (101-128)	92 (76-113)	115 (90-177)	-	6R	-	41 (34-45)	H	0	-	46
17	PL915	IVT-IRFB-E1	79 (60-93)	117 (95-133)	92 (77-105)	149 (80-232)	-	6R	-	37 (32-40)	H	0	-	78
18	PL917	IVT-IRFB-E10	83 (75-94)	121 (106-136)	95 (75-118)	145 (100-230)	-	6R	-	39 (35-46)	H	0	-	57
19	PL920	IVT-IRFB-E21	80 (72-89)	117 (101-130)	93 (74-105)	153 (104-257)	-	6R	-	42 (36-52)	H	0	-	79
20	DWRB215	IVT-IRFB-E17	78 (68-96)	117 (99-137)	82 (70-98)	103 (79-137)	-	6R	-	43 (34-52)	H	0	-	68
21	BH 946(C)	IVT-IRFB-E8	80 (71-94)	118 (102-136)	95 (82-115)	126 (99-167)	-	6R	-	42 (36-49)	H	0.1	-	35
22	RD2552(C)	IVT-IRFB-E12	84 (78-93)	122 (113-135)	93 (82-101)	144 (110-240)	-	6R	-	39 (32-46)	H	0	-	45
23	DWRB137(C)	IVT-IRFB-E18	75 (63-88)	115 (97-127)	79 (59-108)	125 (104-171)	-	6R	-	45 (38-52)	H	0	-	57
24	RD2899 (C)	IVT-IRFB-E20	82 (72-87)	120 (110-128)	94 (81-102)	177 (112-370)	-	6R	-	44 (34-52)	H	0	-	35
25	BH902(C)	IVT-IRFB-E9	83 (76-92)	121 (105-134)	96 (76-113)	133 (97-222)	-	6R	-	43 (38-49)	H	0.1	-	57

Summary of ancillary and disease data (Rabi 2019-20)

IVT-IR-TS- FB **ZONE: CZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			DISEASE REACTION		
			H. days	M. days	Height	Tillering per meter	SL	2-6 Row	Colour	1000 g.w (g)	H/N	YR	LR	Leaf Blight
1	KB1816	IVT-IRFB-E6	68 (46-88)	108 (85-116)	79 (62-98)	133 (93-163)	-	6R	-	40 (34-46)	H	-	-	-
2	KB1817	IVT-IRFB-E23	78 (69-91)	111 (98-121)	88 (74-104)	120 (84-145)	-	6R	-	43 (39-45)	H	-	-	-
3	KB1822	IVT-IRFB-E5	76 (66-92)	114 (101-123)	90 (70-103)	123 (76-161)	-	6R	-	46 (44-48)	H	-	-	-
4	HUB271	IVT-IRFB-E16	67 (44-80)	109 (94-118)	93 (71-110)	111 (61-176)	-	6R	-	43 (29-52)	H	-	-	-
5	HUB272	IVT-IRFB-E25	75 (63-95)	111 (96-118)	91 (78-105)	122 (75-167)	-	6R	-	42 (41-42)	H	-	-	-
6	NDB1738	IVT-IRFB-E4	77 (59-88)	112 (90-127)	90 (68-102)	122 (92-161)	-	6R	-	44 (40-48)	H	-	-	-
7	BH1029	IVT-IRFB-E14	75 (59-95)	110 (92-118)	87 (65-109)	121 (65-166)	-	6R	-	45 (40-48)	H	-	-	-
8	BH1030	IVT-IRFB-E24	72 (64-79)	113 (99-119)	80 (63-101)	135 (92-165)	-	6R	-	48 (42-52)	H	-	-	-
9	BH1031	IVT-IRFB-E22	70 (57-76)	112 (102-120)	99 (76-117)	108 (68-152)	-	6R	-	45 (42-46)	H	-	-	-
10	RD3011	IVT-IRFB-E3	72 (51-91)	109 (90-122)	94 (80-110)	133 (80-166)	-	6R	-	45 (41-52)	H	-	-	-
11	RD3012	IVT-IRFB-E19	74 (51-92)	109 (87-122)	90 (70-106)	114 (73-141)	-	6R	-	48 (42-58)	H	-	-	-
12	RD3013	IVT-IRFB-E11	72 (52-91)	110 (91-120)	79 (58-94)	123 (98-163)	-	6R	-	40 (34-45)	H	-	-	-
13	RD3014	IVT-IRFB-E2	71 (55-80)	112 (93-124)	89 (65-101)	127 (83-172)	-	6R	-	46 (43-53)	H	-	-	-
14	UPB1087	IVT-IRFB-E13	76 (64-83)	115 (104-124)	108 (94-124)	121 (82-157)	-	6R	-	44 (39-48)	H	-	-	-
15	UPB1088	IVT-IRFB-E7	75 (57-92)	114 (103-124)	103 (86-113)	107 (70-141)	-	6R	-	46 (41-51)	H	-	-	-
16	PL911	IVT-IRFB-E15	72 (59-80)	113 (98-122)	92 (60-112)	110 (67-151)	-	6R	-	42 (40-43)	H	-	-	-
17	PL915	IVT-IRFB-E1	73 (53-88)	113 (91-126)	90 (72-106)	105 (52-150)	-	6R	-	42 (40-44)	H	-	-	-
18	PL917	IVT-IRFB-E10	74 (60-83)	110 (94-121)	90 (62-109)	114 (88-141)	-	6R	-	44 (41-47)	H	-	-	-
19	PL920	IVT-IRFB-E21	76 (55-92)	111 (91-124)	90 (75-107)	108 (87-144)	-	6R	-	52 (47-57)	H	-	-	-
20	DWRB215	IVT-IRFB-E17	73 (57-91)	109 (92-119)	84 (69-97)	112 (77-141)	-	6R	-	45 (41-49)	H	-	-	-
21	BH 946 (C)	IVT-IRFB-E8	72 (55-89)	109 (92-117)	89 (70-110)	129 (80-214)	-	6R	-	47 (41-51)	H	-	-	-
22	RD2552 (C)	IVT-IRFB-E12	78 (66-91)	114 (105-124)	84 (71-94)	136 (116-162)	-	6R	-	46 (43-49)	H	-	-	-
23	DWRB137 (C)	IVT-IRFB-E18	72 (60-88)	109 (94-117)	70 (55-82)	112 (60-163)	-	6R	-	49 (45-50)	H	-	-	-
24	RD2899 (C)	IVT-IRFB-E20	74 (61-88)	110 (94-118)	95 (69-108)	119 (78-153)	-	6R	-	47 (43-50)	H	-	-	-
25	BH902 (C)	IVT-IRFB-E9	76 (63-83)	113 (103-123)	92 (65-104)	114 (86-166)	-	6R	-	46 (43-48)	H	-	-	-

ADVANCED/ INITIAL VARIETAL TRIAL (IRRIGATED) HULLESS

The AVT/ IVT hulless barley was proposed at 14 locations comprising of NWPZ (6), NEPZ (3) and Central Zone (5) in northern plains. The trial was conducted at all locations. The results from all the locations were included for zonal compilation in all the three zones (NWPZ, NEPZ and CZ).

The trial consisted of six entries and four checks, namely Karan16, NDB943, K1149 and PL891. The trial was monitored during the crop season in NWPZ (Hisar Ludhiana and Durgapura) NEPZ (Kanpur, Faizabad and Varanasi) and Central Cone (Udaipur and Vijapur) by the zonal monitoring teams. Entry KB1848 and check Karan16 were observed as segregating/ mixtures up to a considerable level; while UPB1086, KB1843, DWRB216, PL891 and DWRB217 were having off types and need purification, based on NWPZ, NEPZ and Central Zone observations.

In NWPZ, yellow rust score of 80S was observed in checks Karan16 and, NDB943 and 40S in entry KB1848. In this zone incidence of aphid was noticed in checks and entries at many centres. In NEPZ, four genotypes (entry UPB1086, and checks; Karan16, K1149 and NDB943) were observed with high score of leaf blight.

In case of grain yield, in NWPZ, entry DWRB204 ranked first with 38.9 q/ha mean grain yield followed by UPB1086 (38.9 q/ha) and check Karan16 (38.1 q/ha) in the first non-significant group. In NEPZ, UPB1086 (46.7 q/ha) ranked first and was followed by check Karan16 (39.9 q/ha) in the first NSG. In case of Central Zone entry UPB1086 (46.8 q/ha) ranked first and was followed by check Karan16 (46.5 q/ha) in the first Non-Significant Group.

Grain Yield Data (2019-20)

Trial: IVT/AVT-IR-TS-HLS **Zone: NWPZ**

SN	Entry	Code	HAU Hisar			Durgapura			Karnal			Modipuram			Pantnagar			Ludhiana			NWPZ		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	KB1843	IVT/AVT-HLS-3	22.5	9	0	27.0	10	0	16.5	10	0	42.9	10	0	21.4	7	0	24.6	2	1	**25.8**	10	0
2	KB1848	IVT/AVT-HLS-8	28.6	7	0	39.3	5	0	27.1	7	0	48.7	8	0	25.7	5	0	16.0	10	0	**30.9**	7	0
3	DWRB204	IVT/AVT-HLS-2	38.3	2	1	46.8	1	1	31.6	3	0	55.5	4	0	37.6	1	1	23.6	3	0	**38.9**	1	1
4	DWRB216	IVT/AVT-HLS-6	35.0	3	0	35.5	7	0	26.4	8	0	48.1	9	0	32.7	4	0	19.2	7	0	**32.8**	6	0
5	DWRB217	IVT/AVT-HLS-10	34.5	4	0	44.8	2	1	30.8	4	0	53.0	5	0	23.1	6	0	21.7	6	0	**34.7**	5	0
6	UPB1086	IVT/AVT-HLS-1	34.4	5	0	44.3	3	1	35.5	2	0	55.9	3	0	35.7	3	1	27.6	1	1	**38.9**	2	1
7	Karan16(C)	IVT/AVT-HLS-5	39.9	1	1	40.7	4	1	28.3	5	0	60.4	1	1	36.3	2	1	22.7	4	0	**38.1**	3	1
8	NDB943(C)	IVT/AVT-HLS-9	29.9	6	0	35.7	6	0	47.7	1	1	56.8	2	0	20.0	9	0	18.1	9	0	**34.7**	4	0
9	K1149(C)	IVT/AVT-HLS-7	24.2	8	0	32.2	8	0	21.1	9	0	52.3	6	0	20.8	8	0	18.1	8	0	**28.1**	8	0
10	PL891(I)	IVT/AVT-HLS-4	15.4	10	0	29.3	9	0	28.0	6	0	50.9	7	0	19.3	10	0	22.7	4	0	**27.6**	9	0
		G.M.	**30.3**			**37.6**			**29.3**			**52.5**			**27.3**			**21.4**			**33.0**		
		S.E.(M)	1.2			2.8			1.8			1.2			1.0			1.3			**0.7**		
		C.D.	3.0			6.8			4.4			3.0			2.5			3.2			**1.6**		
		C.V.	8.2			15.1			12.4			4.7			7.6			12.6					
		DOS	14.11.19			10.11.2019			15.11.2019			11.11.19			11.11.2019			11.11.2019					

IVT-AVT-FB-(HLS) **Summary of ancillary and disease data** **ZONE: NWPZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean & Range)					GRAIN CHARACTERISTICS		DISEASE REACTION		
			H. days	M. days	Height (cm)	Tillering per meter	2/6 Row	1000 g.w (g)	H/N	Rust YR	Rust LR	Leaf Blight
1	KB1843	IVT/AVT-HLs-3	95.2 (80-105)	135 (119-153)	115(107-121)	134 (106-169)	6R	39 (35-48)	HL	-	10	35
2	KB1848	IVT/AVT-HLs-8	90 (72-99)	135(118-153)	101(88-115)	124 (101-172)	2R	37 (31-40)	HL	-	15	24
3	DWRB204*	IVT/AVT-HLs-2	87.6 (69-97)	132(106-152)	114(90-172)	119 (108-130)	6R	38 (34-44)	HL	-	0	24
4	DWRB216	IVT/AVT-HLs-6	92.4(75-101)	134 (120-147)	108(96-120)	109(96-127)	6R	35 (27-44)	HL	-	0	13
5	DWRB217	IVT/AVT-HLs-10	91.6 (76-99)	135(120-150)	106(95-110)	117(104-133)	6R	38 (33-44)	HL	-	0	13
6	UPB1086	IVT/AVT-HLs-1	89.8 (73-98)	134(118-151)	106(86-140)	115 (100-128)	6/2*	34 (27-44)	HL	-	0	46
7	Karan16(C)	IVT/AVT-HLs-5	87 (70-95)	134(116-149)	110(102-120)	126 (108-145)	6R	35 (32-40)	HL	-	0	34
8	NDB943(C)	IVT/AVT-HLs-9	84.2 (69-93)	129(104-150)	111(95-125)	144 (88-270)	6R	36 (32-44)	HL	-	0	13
9	K1149(C)	IVT/AVT-HLs-7	85.6(74-93)	131(115-147)	105(97-115)	147 (93-250)	6R	31 (27-36)	HL	-	0	13
10	PL891(I)	IVT/AVT-HLs-4	94.2(83-100)	133(120-147)	115(98-130)	113 (88-152)	2R	47 (40-52)	HL	-	0	12

Grain Yield Data (2019-20)

Trial: IVT/AVT-IR-TS-HLS **Zone: NEPZ**

SN	Entry	Code	Faizabad			Kanpur			Varanasi			NEPZ			Over All		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	KB1843	IVT/AVT-HLS-3	26.7	10	0	24.5	6	0	15.1	8	0	**22.1**	9	0	**28.4**	9	0
2	KB1848	IVT/AVT-HLS-8	33.8	5	0	29.0	5	0	13.3	9	0	**25.4**	8	0	**33.0**	7	0
3	DWRB204	IVT/AVT-HLS-2	29.0	9	0	45.3	1	1	32.0	1	1	**35.4**	1	1	**39.0**	3	0
4	DWRB216	IVT/AVT-HLS-6	39.2	1	1	24.5	6	0	20.9	7	0	**28.2**	5	0	**34.0**	6	0
5	DWRB217	IVT/AVT-HLS-10	38.3	3	0	21.7	10	0	21.5	6	0	**27.2**	7	0	**35.7**	4	0
6	UPB1086	IVT/AVT-HLS-1	30.0	8	0	40.8	2	0	25.8	2	0	**32.2**	3	0	**40.3**	1	1
7	Karan16(C)	IVT/AVT-HLS-5	39.1	2	1	34.4	3	0	24.7	4	0	**32.7**	2	0	**39.9**	2	1
8	NDB943(C)	IVT/AVT-HLS-9	30.5	7	0	30.8	4	0	24.0	5	0	**28.4**	4	0	**34.7**	5	0
9	K1149(C)	IVT/AVT-HLS-7	35.2	4	0	23.6	8	0	25.7	3	0	**28.1**	6	0	**32.1**	8	0
10	PL891(I)	IVT/AVT-HLS-4	31.3	6	0	23.6	9	0	10.2	10	0	**21.7**	10	0	**25.7**	10	0
		G.M.	**33.3**			**29.8**			**21.3**			**28.1**			**34.3**		
		S.E.(M)	0.3			1.9			0.8			**0.7**			**0.4**		
		C.D.	0.7			4.5			2.0			**1.6**			**1.0**		
		C.V.	1.7			12.6			8.0								
		DOS	18.11.2019			30.11.19			15.11.2019								

IVT-AVT-FB-(HLS) **Summary of ancillary and disease data** **ZONE: NWPZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean & Range)					GRAIN CHARACTERISTICS		DISEASE REACTION		
			H. days	M. days	Height (cm)	Tillering per meter	2/6 Row	1000 g.w (g)	H/N	Rust YR	Rust LR	Leaf Blight
1	KB1843	IVT/AVT-HLs-3	95.2 (80-105)	135 (119-153)	115(107-121)	134 (106-169)	6R	39 (35-48)	HL	-	10	35
2	KB1848	IVT/AVT-HLs-8	90 (72-99)	135(118-153)	101(88-115)	124 (101-172)	2R	37 (31-40)	HL	-	15	24
3	DWRB204*	IVT/AVT-HLs-2	87.6 (69-97)	132(106-152)	114(90-172)	119 (108-130)	6R	38 (34-44)	HL	-	0	24
4	DWRB216	IVT/AVT-HLs-6	92.4(75-101)	134 (120-147)	108(96-120)	109(96-127)	6R	35 (27-44)	HL	-	0	13
5	DWRB217	IVT/AVT-HLs-10	91.6 (76-99)	135(120-150)	106(95-110)	117(104-133)	6R	38 (33-44)	HL	-	0	13
6	UPB1086	IVT/AVT-HLs-1	89.8 (73-98)	134(118-151)	106(86-140)	115 (100-128)	6/2*	34 (27-44)	HL	-	0	46
7	Karan16(C)	IVT/AVT-HLs-5	87 (70-95)	134(116-149)	110(102-120)	126 (108-145)	6R	35 (32-40)	HL	-	0	34
8	NDB943(C)	IVT/AVT-HLs-9	84.2 (69-93)	129(104-150)	111(95-125)	144 (88-270)	6R	36 (32-44)	HL	-	0	13
9	K1149(C)	IVT/AVT-HLs-7	85.6(74-93)	131(115-147)	105(97-115)	147 (93-250)	6R	31 (27-36)	HL	-	0	13
10	PL891(I)	IVT/AVT-HLs-4	94.2(83-100)	133(120-147)	115(98-130)	113 (88-152)	2R	47 (40-52)	HL	-	0	12

Grain Yield Data (2019-20)

Trial: IVT/AVT-IR-TS-HLS **Zone: CZ**

SN	Entry	Code	CAU, Jhansi			Vijapur			Udaipur			Tikamgarh			Gwalior			CZ		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	KB1843	IVT/AVT-HLS-3	20.9	10	0	25.6	7	0	33.8	8	0	56.7	4	0	39.4	7	1	**35.3**	9	0
2	KB1848	IVT/AVT-HLS-8	38.4	4	0	26.7	6	0	32.1	10	0	62.2	2	0	41.6	5	1	**40.2**	5	0
3	DWRB204	IVT/AVT-HLS-2	38.2	5	0	30.6	5	0	45.8	3	0	49.5	8	0	42.2	3	1	**41.2**	4	0
4	DWRB216	IVT/AVT-HLS-6	36.3	7	0	30.9	4	0	37.0	7	0	49.0	9	0	42.1	4	1	**39.1**	7	0
5	DWRB217	IVT/AVT-HLS-10	36.7	6	0	31.1	3	0	51.4	1	1	53.6	5	0	37.8	9	0	**42.1**	3	0
6	UPB1086	IVT/AVT-HLS-1	57.5	1	1	23.2	8	0	50.1	2	1	66.5	1	1	36.8	10	0	**46.8**	1	1
7	Karan16(C)	IVT/AVT-HLS-5	53.0	2	0	35.1	1	1	43.9	4	0	57.1	3	0	43.2	2	1	**46.5**	2	1
8	NDB943(C)	IVT/AVT-HLS-9	38.7	3	0	21.1	9	0	40.1	5	0	53.4	6	0	38.4	8	0	**38.3**	8	0
9	K1149(C)	IVT/AVT-HLS-7	27.4	9	0	34.7	2	1	37.7	6	0	52.2	7	0	44.2	1	1	**39.2**	6	0
10	PL891(I)	IVT/AVT-HLS-4	31.6	8	0	5.2	10	0	33.2	9	0	19.2	10	0	40.4	6	1	**25.9**	10	0
		G.M.	**37.9**			**26.4**			**40.5**			**51.9**			**40.6**			**39.5**		
		S.E.(M)	1.8			1.4			2.1			1.1			2.3			**0.8**		
		C.D.	4.3			3.5			5.0			2.6			5.5			**1.9**		
		C.V.	9.4			10.9			10.3			4.1			11.3					
		DOS	19.11.2019			7.11.19			25.11.2019			12.11.2019			18.11.2019					

IVT-AVT-FB-(HLS) Summary of ancillary and disease data (Rabi 2019-20) **ZONE: CZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			DISEASE REACTION		
			H. days	M. days	Height (cm)	Tillering/M	SL(cm)	2/6 R	Colour	1000 g.w (g)	H/N	YR	LR	L Blight
1	KB1843	IVT/AVT-HLs-3	82 (69-92)	114 (95-129)	105 (90-123)	99 (72-126)		6R		37 (33-44)	HL			
2	KB1848	IVT/AVT-HLs-8	79 (63-90)	117 (93-136)	91 (75-117)	112 (91-130)		2R		39 (34-42)	HL			
3	DWRB204	IVT/AVT-HLs-2	76 (54-90)	113 (94-130)	87 (64-101)	90 (63-121)		6R		40 (36-43)	HL			
4	DWRB216	IVT/AVT-HLs-6	80 (67-90)	116 (99-134)	99 (80-110)	104 (73-148)		6R		39 (31-44)	HL			
5	DWRB217	IVT/AVT-HLs-10	79 (62-87)	114 (99-128)	94 (70-122)	81 (31-121)		6R		40 (36-45)	HL			
6	UPB1086	IVT/AVT-HLs-1	78 (64-87)	112 (97-127)	86 (61-97)	96 (69-121)		6R		35 (29-38)	HL			
7	Karan16(C)	IVT/AVT-HLs-5	72 (50-86)	113 (96-129)	96 (67-116)	90 (64-124)		6R		40 (33-46)	HL			
8	NDB943(C)	IVT/AVT-HLs-9	75 (62-82)	114 (92-126)	100 (74-116)	86 (46-124)		6R		40 (32-46)	HL			
9	K1149(C)	IVT/AVT-HLs-7	75 (60-84)	114 (97-128)	87 (80-104)	94 (59-125)		6R		35 (31-38)	HL			
10	PL891(I)	IVT/AVT-HLs-4	90 (85-98)	122 (110-136)	98 (67-120)	95 (67-136)		2R		42 (37-45)	HL			

INITIAL VARIETAL TRIAL (RAINFED) – NEPZ

The Initial Varietal Trial under Rainfed Conditions (IVT-RF) was proposed at the 8 locations in the North Eastern Plains Zone of the country. The trial was conducted successfully at all locations. The data were also received from all centres. and entire data were in accordance for After the statistical analysis data from all centres were considered for reporting.

The trial consisted of 15 genotypes including 13 entries and two (K603 and Lakhan) check varieties. The trial was monitored at all centres, during proper crop stage and no segregations/ off types were reported at any centre in any genotype.

No major disease/ pest incidence was reported at the trial conducting centers in the season except moderate to heavy incidence of spot blotch at Kanpur, Saini, CAU Pusa and Sabour centres.

In case of grain yield, the trials mean value ranged from 20.7 q/ha (Sabour) to 40.9 q/ha (Kanpur). With a mean grain yield of 33.9 q/ha check variety Lakhan ranked first followed by entries DWRB213 (33.9q/ha), KB1832 (33.6 q/ha) and KB1830 (33.3 q/ha) in the first non-significant group.

Grain Yield Data (2019-20)

Trial: IVT-RF-TS **Zone: NEPZ**

SN	Varieties	Code No.	Kanpur			Saini			Varanasi			Faizabad			Chianki		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	KB1815	IVT-RF-FB-NEPZ-10	40.1	9	0	33.3	6	0	6.8	15	0	27.8	9	1	36.6	4	0
2	KB1830	IVT-RF-FB-NEPZ-2	40.6	8	0	31.5	8	0	21.1	10	0	28.7	6	1	45.0	1	1
3	KB1832	IVT-RF-FB-NEPZ-14	51.6	2	1	32.6	7	0	22.5	9	0	29.9	1	1	32.9	6	0
4	HUB69	IVT-RF-FB-NEPZ-7	35.1	13	0	26.1	10	0	33.4	4	0	29.8	2	1	30.4	8	0
5	HUB270	IVT-RF-FB-NEPZ-9	24.5	15	0	21.7	12	0	36.2	3	0	26.9	13	0	34.9	5	0
6	NDB1748	IVT-RF-FB-NEPZ-1	38.0	11	0	18.8	14	0	30.1	5	0	29.0	4	1	27.1	11	0
7	RD3019	IVT-RF-FB-NEPZ-11	42.2	6	0	30.1	9	0	23.1	8	0	22.9	15	0	30.1	9	0
8	RD3020	IVT-RF-FB-NEPZ-3	51.2	3	1	34.4	4	0	30.0	6	0	27.7	12	1	38.2	3	0
9	RD3021	IVT-RF-FB-NEPZ-15	41.3	7	0	44.2	1	1	15.1	12	0	27.7	11	1	20.3	14	0
10	RD3022	IVT-RF-FB-NEPZ-6	45.0	5	0	38.0	2	0	19.4	11	0	28.1	7	1	25.6	12	0
11	PL918	IVT-RF-FB-NEPZ-13	52.1	1	1	35.3	3	0	9.6	14	0	28.0	8	1	19.3	15	0
12	PL925	IVT-RF-FB-NEPZ-8	38.8	10	0	19.9	13	0	11.3	13	0	24.2	14	0	21.6	13	0
13	DWRB213	IVT-RF-FB-NEPZ-4	50.0	4	1	33.5	5	0	29.8	7	0	28.9	5	1	32.9	7	0
14	K 603 (C)	IVT-RF-FB-NEPZ-12	26.8	14	0	18.5	15	0	43.7	1	1	27.8	9	1	28.7	10	0
15	Lakhan (C)	IVT-RF-FB-NEPZ-5	36.0	12	**0**	25.4	11	0	41.1	2	1	29.6	3	1	41.3	2	1
		G.M.	**40.9**			**29.6**			**24.9**			**27.8**			**31.0**		
		S.E.(M)	1.8			1.6			1.3			1.1			1.9		
		C.D.	4.2			3.8			3.2			2.6			4.4		
		C.V.	8.7			10.7			10.7			7.8			12.0		
		DOS	10.11.2019			09.11.2019			07.11.2019			08.11.2019			10.11.2019		

Grain Yield Data (2019-20)

Trial: IVT-RF-TS **Zone: NEPZ**

SN	Varieties	Code No.	Ranchi			Pusa (CAU)			Sabour			Pooled		
			Yield	**Rk**	**G**	**Yield**	**Rk**	**G**	**Yield**	**Rk**	**G**	**Yield**	**Rk**	**G**
1	KB1815	IVT-RF-FB-NEPZ-10	36.4	6	0	12.3	15	0	19.9	10	0	**26.7**	11	0
2	KB1830	IVT-RF-FB-NEPZ-2	48.9	1	1	27.2	7	0	23.1	7	0	**33.3**	4	1
3	KB1832	IVT-RF-FB-NEPZ-14	46.2	3	1	30.1	4	0	23.3	6	0	**33.6**	3	1
4	HUB69	IVT-RF-FB-NEPZ-7	48.4	2	1	32.4	2	1	24.8	4	0	**32.5**	5	0
5	HUB270	IVT-RF-FB-NEPZ-9	25.5	15	0	34.1	1	1	20.4	9	0	**28.0**	10	0
6	NDB1748	IVT-RF-FB-NEPZ-1	37.0	4	0	28.3	5	0	19.7	11	0	**28.5**	9	0
7	RD3019	IVT-RF-FB-NEPZ-11	32.6	10	0	16.3	11	0	7.5	15	0	**25.6**	12	0
8	RD3020	IVT-RF-FB-NEPZ-3	31.5	12	0	25.7	8	0	20.4	8	0	**32.4**	6	0
9	RD3021	IVT-RF-FB-NEPZ-15	29.9	14	0	12.5	14	0	8.4	14	0	**24.9**	13	0
10	RD3022	IVT-RF-FB-NEPZ-6	34.2	9	0	14.5	12	0	24.4	5	0	**28.7**	8	0
11	PL918	IVT-RF-FB-NEPZ-13	32.0	11	0	13.8	13	0	9.2	13	0	**24.9**	14	0
12	PL925	IVT-RF-FB-NEPZ-8	30.4	13	0	22.1	10	0	18.8	12	0	**23.4**	15	0
13	DWRB213	IVT-RF-FB-NEPZ-4	37.0	4	0	28.3	5	0	31.1	2	1	**33.9**	2	1
14	K 603 (C)	IVT-RF-FB-NEPZ-12	34.8	8	0	23.9	9	0	28.7	3	1	**29.1**	7	0
15	Lakhan (C)	IVT-RF-FB-NEPZ-5	35.9	7	0	30.8	3	0	31.6	1	1	**33.9**	1	1
		G.M.	**36.0**			**23.5**			**20.7**			**29.3**		
		S.E.(M)	2.3			0.9			1.8			**0.6**		
		C.D.	5.4			2.3			4.2			**1.3**		
		C.V.	12.6			8.1			16.9					
		DOS	10.11.2019			10.11.2019			10.11.2019					

Trial: IVT (Rainfed) **Ancillary Data of Barley Trial (2019-20)** **ZONE: NEPZ**

SN	Varieties	Code	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			Disease reaction			
			H. days	M. days	Height (cm)	Tillering /m	SL (cm)	2/6R	Colour	1000 g.w	H/N	Rusts		Leaf Blight	
												YR	LR	NB	SB*
1	KB1815	IVT-RF-FB-10	88 (70-104)	125 (104-132)	91.5 (78-114)	90 (52-129)	7.8 (6.5-9.0)	6	LY	44.6 (32.0-60.6)	H	-	-	-	24 (57)
2	KB1830	IVT-RF-FB--2	82 (67-94)	120 (103-125)	90.3 (78-106)	101 (65-146)	8.3 (6.6-10.0)	6	LY	43.4 (32.0-52.6)	H	-	-	-	24 (46)
3	KB1832	IVT-RF-FB-14	80 (69-89)	120 (110-128)	92.0 (78-118)	102 (65-151)	9.2 (9.0-9.9)	6	LY	45.1 (32.0-64.6)	H	-	-	-	13 (46)
4	HUB69	IVT-RF-FB-7	79 (74-84)	120 (111-128)	91.0 (78-111)	107 (83-156)	7.9 (7.2-8.5)	6	LY	44.1 (32.0-57.6)	H	-	-	-	24 (68)
5	HUB270	IVT-RF-FB-9	71 (64-80)	112 (104-128)	91.3 (78-113)	95 (74-111)	7.6 (7.0-9.0)	6	LY	44.4 (32.0-59.6)	H	-	-	-	13 (35)
6	NDB1748	IVT-RF-FB-1	79 (66-91)	119 (100-126)	90.2 (78-105)	110 (55-224)	8.6 (7.5-9.5)	6	LY	43.3 (32.0-51.6)	H	-	-	-	12 (35)
7	RD3019	IVT-RF-FB-11	81 (76-84)	120 (114-130)	91.6 (78-115)	92 (55-122)	9.0 (8.0-10.5)	6	LY	44. 3 (2.0-61.6)	H	-	-	-	67 (79)
8	RD3020	IVT-RF-FB--3	79 (74-84)	120 (115-126)	90.5 (78-107)	103 (78-138)	8.0 (6.2-9.1)	6	LY	43.6 (32.0-53.6)	H	-	-	-	35 (68)
9	RD3021	IVT-RF-FB-15	77 (66-83)	117 (107-130)	92.2 (78-119)	94 (64-128)	9.6 (7.8-12.0)	6	LY	45.3 (32.0-65.6)	H	-	-	-	56 (89)
10	RD3022	IVT-RF-FB-6	78 (63-87)	118 (111-125)	90.9 (78-110)	107 (65-167)	8.0 (6.9-9.0)	6	LY	44.0 (32.0-56.6)	H	-	-	-	44 (68)
11	PL918	IVT-RF-FB-13	85 (78-93)	123 (111-128)	91.9 (78-117)	113 (77-159)	8.3 (7.0-10.5)	6	LY	45.0 (32.0-63.6)	H	-	-	-	24 (68)
12	PL925	IVT-RF-FB-8	82 (75-93)	120 (115-128)	91.2 (78-112)	87 (45-134)	9.3 (8.0-11.0)	6	LY	44.3 (32.0-58.6)	H	-	-	-	23 (46)
13	DWRB213	IVT-RF-FB--4	77 (71-84)	116 (109-132)	90.6 (78-108)	98 (78-123)	7.7 (6.0-10.0)	6	LY	43.7 (32.0-54.6)	H	-	-	-	35 (79)
14	K 603 (C)	IVT-RF-FB-12	79 (73-83)	120 (115-129)	91.8 (78-116)	101 (75-133)	9.2 (7.8-11.0)	6	LY	44.8 (32.0-62.6)	H	-	-	-	24 (68)
15	Lakhan (C)	IVT-RF-FB-5	79 (70-89)	119 (108-127)	90.8 (78-109)	102 (80-127)	8.0 (6.4-9.0)	6	LY	43.8 (32.0-55.6)	H	-	-	-	24 (57)

** Data of Spot Blotch from Kanpur, Saini, CAU Pusa and Sabour centers (Mean & HS) only*

ADVANCED VARIETAL TRIAL (SALINITY) - NWPZ/NEPZ

The Advanced Varietal Trial (Salinity) of barley was proposed at the 7 locations spread across the North Western Plains Zone and North Eastern Plains Zone of the country. The trial was conducted at all locations except Banasthali. The data were received from remaining 6 centres, where trial was conducted. The data of Rampura centre was not considered for reporting due to unrealistic yield levels. Finally, the data from 5 locations only were considered for zonal compilation.

The trial consisted of 18 genotypes including 14 test entries and four (RD2552, NDB1173, RD2794 and RD2907) check varieties. The trial was monitored at all centres, during proper crop stage and entries BH1033 and HUB273 were recorded with off-types.

No major disease/ pest incidence was reported at the trial conducting centers in the season except moderate incidence of net and spot blotch incidence at Hisar centre and spot blotch at Dalipnagar. Overall, the crop was in good health at other locations.

In case of grain yield, the trials mean value ranged from 19.4 q/ha (Faizabad) to 31.6 q/ha (HAU Hisar). Amongst the genotypes, only entry RD3016 (32.8 q/ha) was in 1st non-significant group. Another entry KB1822 (30.4 q/ha) ranked second in the trial. However, both entries were found significantly superior to the best check RD2794 (28.5 q/ha).

Grain Yield Data (2019-20)

Trial: AVT/IVT (Salinity-Alkalinity) **Zone: NWPZ & NEPZ**

SN	Varieties	Code No.	IIWBR-Hisar			HAU Hisar			Dalipnagar			Faizabad			Fatehpur			Over all		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	BH1032	AVT-SAL-ALK-IR-12	26.5	15	0	33.5	5	0	44.4	2	1	10.7	17	0	19.2	16	0	**26.9**	11	0
2	BH1033	AVT-SAL-ALK-IR-5	26.5	16	0	39.0	2	1	20.4	16	0	20.5	5	0	25.2	10	0	**26.3**	13	0
3	KB1822	AVT SAL-ALK-IR-10	25.6	17	0	40.1	1	1	30.8	12	0	31.6	1	1	23.9	12	0	**30.4**	2	0
4	KB1815	AVT-SAL-ALK-IR-16	29.2	7	0	32.6	7	0	16.3	18	0	12.0	16	0	38.4	1	1	**25.7**	17	0
5	KB1845	AVT-SAL-ALK-IR-1	24.0	18	0	18.3	18	0	27.2	13	0	19.9	8	0	17.7	17	0	**21.4**	18	0
6	HUB273	AVT-SAL-ALK-IR-15	31.7	2	1	28.7	15	0	31.7	11	0	18.7	10	0	22.5	14	0	**26.7**	12	0
7	HUB274	AVT-SAL-ALK-IR-4	30.3	5	0	31.3	11	0	31.7	10	0	18.1	12	0	32.0	4	0	**28.7**	4	0
8	NDB1730	AVT-SAL-ALK-IR-9	27.3	12	0	30.4	12	0	46.2	1	1	18.7	11	0	20.8	15	0	**28.7**	5	0
9	NDB1742	AVT-SAL-ALK-IR-11	29.3	6	0	32.7	6	0	40.8	3	0	8.9	18	0	31.2	6	0	**28.6**	6	0
10	DWRB214	AVT-SAL-ALK-IR-2	30.6	4	0	32.2	9	0	34.4	7	0	17.8	14	0	16.0	18	0	**26.2**	14	0
11	RD3015	AVT-SAL-ALK-IR-17	33.4	1	1	30.3	13	0	23.6	15	0	19.0	9	0	22.7	13	0	**25.8**	16	0
12	RD3016	AVT-SAL-ALK-IR-13	27.6	11	0	37.0	3	1	36.2	4	0	27.5	3	0	35.4	3	1	**32.8**	1	1
13	RD3017	AVT-SAL-ALK-IR-3	30.8	3	0	31.6	10	0	35.3	5	0	18.0	13	0	31.4	5	0	**29.4**	3	0
14	RD3018	AVT-SAL-ALK-IR-7	28.7	9	0	35.5	4	1	35.3	5	0	14.0	15	0	27.5	7	0	**28.2**	8	0
15	RD2552(C)	AVT-SAL-ALK-IR-18	27.0	14	0	27.2	16	0	19.4	17	0	29.6	2	0	25.8	9	0	**25.8**	15	0
16	NDB1173(C)	AVT-SAL-ALK-IR-14	27.3	13	0	25.8	17	0	34.4	7	0	23.6	4	0	24.3	11	0	**27.1**	10	0
17	RD2794(C)	AVT-SAL-ALK-IR-6	28.9	8	0	32.3	8	0	34.4	7	0	20.2	7	0	26.8	8	0	**28.5**	7	0
18	RD2907(C)	AVT-SAL-ALK-IR-8	28.6	10	0	30.0	14	0	24.5	14	0	20.3	6	0	35.8	2	1	**27.8**	9	0
		G.M.	**28.5**			**31.6**			**31.5**			**19.4**			**26.5**			**27.5**		
		S.E.(M)	0.8			2.4			1.8			0.6			1.3			**0.7**		
		C.D.	1.9			5.6			4.2			1.5			3.0			**1.6**		
		C.V.	5.7			14.9			11.3			6.3			9.7					
		DOS	14.11.2019			14.11.2019			19.11.2019			25.11.2019			19.11.2019					

Trial: AVT/IVT (Salinity-Alkalinity) **Ancillary Data of Barley Trial (2019-20)** **ZONE: NWPZ & NEPZ**

SN	Varieties	Code No.	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			Disease reaction (Mean & HS)			
			H. days	M. days	Plant height (cm)	Tillering /m	Spike length (cm)	2R/6R	Colour	1000 g.w (M & Range)	H/N	Rusts		Leaf Blight	
												YR	LR	NB*	SB **
1	BH1032	AVT-SAL/ALK--12	82 (65-103)	121 (105-133)	69.7 (45.4-89.0)	98 (40-140)	6.3 (4.0-9.5)	6	Y	41.1 (34.0-48.6)	H	-	-	13	12
2	BH1033	AVT-SAL/ALK--5	86 (75-104)	127 (117-135)	87.5 (64.0-106.0)	81 (48-108)	6.9 (6.0-7.5)	6	Y	39.9 (32.0-44.7)	H	-	-	12	24
3	KB1822	AVT-SAL/ALK--10	84 (72-99)	124 (114-136)	84.7 (74.0-100.0)	93 (42-120)	6.5 (4.8-8.2)	6	Y	40.3 (32.0-45.9)	H	-	-	12	24
4	KB1815	AVT-SAL/ALK--16	92 (80-103)	131 (122-138)	95.5 (62.0-112.0)	81 (55-114)	6.8 (5.2-9.5)	6	LY	41.3 (36.0-45.4)	H	-	-	13	24
5	KB1845	AVT-SAL/ALK--1	87 (68-103)	126 (106-139)	77.5 (40.0-100.0)	83 (45-131)	6.3 (5.0-7.0)	6	LY	41.4 (34.0-48.0)	H	-	-	13	34
6	HUB273	AVT-SAL/ALK--15	85 (75-102)	126 (116-137)	85.2 (73.6-104.0)	81 (42-122)	5.6 (3.2-7.5)	6	Y	43.8 (32.0-48.3)	H	-	-	12	23
7	HUB274	AVT-SAL/ALK--4	82 (63-103)	125 (116-138)	86.5 (63.0-105.0)	81 (52-116)	5.9 (4.0-7.0)	6	Y	43.1 (38.5-48.2)	H	-	-	12	13
8	NDB1730	AVT-SAL/ALK--9	95 (89-106)	132 (120-139)	91.1 (79.7-104.0)	108 (40-139)	5.1 (3.6-8.5)	6	LY	43.1 (36.0-50.4)	H	-	-	13	12
9	NDB1742	AVT-SAL/ALK--11	92 (81-104)	131 (120-139)	86.7(72.0-110.0)	101 (47-138)	5.4 (3.2-8.0)	6	LY	42.3 (38.0-46.6)	H	-	-	24	24
10	DWRB214	AVT-SAL/ALK--2	82 (69-97)	126 (115-137)	77.8 (46.4-103.0)	73 (40-120)	7.2 (4.8-10.0)	6	Y	43.3 (38.0-47.1)	H	-	-	13	46
11	RD3015	AVT-SAL/ALK--17	88 (76-103)	129 (117-138)	84.2 (72.0-95.0)	84 (48-105)	7.8 (5.5-9.4)	6	Y	45.3 (38.0-51.0)	H	-	-	13	13
12	RD3016	AVT-SAL/ALK--13	86 (71-100)	124 (110-136)	83.3 (69.4-106.0)	91 (50-131)	8.4 (7.5-10.0)	6	Y	44.3 (36.0-52.3)	H	-	-	12	37
13	RD3017	AVT-SAL/ALK--3	85 (62-101)	125 (108-135)	83.4 (69.4-94.0)	98 (57-138)	6.0 (4.6-7.0)	6	L Y	40.2 (35.0-46.8)	H	-	-	12	24
14	RD3018	AVT-SAL/ALK--7	89 (75-103)	127 (119-137)	87.4 (67.0-108.0)	96 (55-127)	7.6 (6.1-11.4)	6	Y	41.7 (36.0-47.0)	H	-	-	12	24
15	RD2552 (C)	AVT-SAL/ALK--18	91 (80-103)	133 (121-142)	81.1 (55.0-98.0)	105 (55-152)	6.8 (5.5-9.5)	6	Y	41.9 (33.8-47.5)	H	-	-	24	35
16	NDB1173(C)	AVT-SAL/ALK--14	87 (75-102)	129 (117-137)	78.4 (50.0-99.0)	77 (43-115)	7.5 (6.2-10.6)	6	Y	41.8 (34.0-49.0)	H	-	-	12	24
17	RD2794 (C)	AVT-SAL/ALK--6	89 (77-103)	127 (117-137)	78.5 (53.0-104.0)	91 (50-116)	6.1 (5.3-6.7)	6	LY	41.9 (38.0-48.6)	H	-	-	13	24
18	RD2907 (C)	AVT-SAL/ALK--8	87 (76-101)	129 (119-140)	84.1 (70.8-104.0)	86 (53-112)	7.1 (5.6-8.8)	6	Y	45.6 (38.0-50.3)	H	-	-	12	14

**Net blotch data from Hisar centre only, ** Spot blotch data from Hisar and Dalipnagar centres only*

ADVANCED/ INITIAL VARIETAL TRIAL (RAINFED) NH Zone

The IVT/AVT rainfed was proposed at 11 locations of North Hill Zone, comprising of Bajaura, Katrain, Berthein, Kangra, Malan, Shimla, Ranichauri, Majhera, Rajouri, Almora and Khudwani). The trial could not be conducted at Khudwani, because of the suspension of postal services in this region and the trial-parcel could not be dispatched to Khudwani centre. The results from ten locations were received and nine locations were included for zonal compilation as data from Ranichauri location were not considered (low yield levels) for zonal pooling.

The trial consisted of 18 entries and four checks, namely HBL113, BHS352, VLB118 and BHS400. The trial could not be monitored during the crop season as there were mobility restrictions imposed due to pandemic of COVID-19, however, virtual monitoring for barley and wheat was organised by zonal coordinator (NHZ). Entries BHS478 and UPB1084 were observed with off types and need purification, while no entry was rejected for segregation/ mixture.

No major disease/ pest incidence was reported at the trial conducting centers in the season except yellow rust incidence up to 20S in some entries and overall, the crop was in good health.

In case of grain yield, in this zone, check BHS400 ranked first with 36.5 q/ha mean grain yield followed by entries BHS482 (36.4 q/ha) and BHS481 (36.3 q/ha) in the 1st Non-Significant Group.

Grain Yield Data (2019-20)

Trial: AVT-RF-TS **Zone: NHZ**

SN	Entry	Code	Berthein			Almora			Kangra			Malan			Majhera		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	BHS478	NHGBZ 1902	24.72	10	0	33.76	15	0	20.96	16	0	44.23	4	0	46.33	4	1
2	BHS479	NHGBZ 1917	27.80	6	0	30.65	19	0	34.64	2	1	38.87	9	0	50.21	1	1
3	BHS480	NHGBZ 1920	23.52	13	0	35.02	13	0	27.03	9	0	43.45	5	0	44.00	7	0
4	BHS481	NHGBZ 1907	20.50	16	0	36.08	12	0	27.15	8	0	41.13	6	0	44.51	5	1
5	BHS482	NHGBZ 1908	17.96	19	0	37.77	8	0	32.97	3	0	39.64	7	0	49.43	2	1
6	UPB1083	NHGBZ 1915	16.36	20	0	41.67	4	0	17.04	20	0	31.10	18	0	39.08	11	0
7	UPB1084	NHGBZ 1911	19.25	17	0	31.70	18	0	30.43	5	0	26.49	21	0	37.53	15	0
8	UPB1085	NHGBZ 1905	18.14	18	0	46.65	1	1	34.71	1	1	38.48	10	0	43.12	8	0
9	VLB165	NHGBZ 1922	23.96	12	0	43.63	3	1	18.87	19	0	32.08	16	0	44.25	6	0
10	VLB166	NHGBZ 1903	25.47	8	0	33.97	14	0	31.88	4	0	33.36	14	0	38.04	13	0
11	VLB167	NHGBZ 1918	25.16	9	0	36.08	10	0	25.74	11	0	28.27	19	0	33.39	19	0
12	VLB168	NHGBZ 1914	28.62	5	0	27.51	21	0	28.17	7	0	35.12	11	0	41.41	9	0
13	VLB169	NHGBZ 1909	29.04	4	0	39.70	6	0	25.78	10	0	39.11	8	0	34.94	17	0
14	HBL864,	NHGBZ 1919	22.00	15	0	27.17	22	0	22.96	15	0	25.95	22	0	32.09	20	0
15	HBL865	NHGBZ 1913	22.55	14	0	46.50	2	1	18.97	18	0	46.01	2	0	38.56	12	0
16	HBL866	NHGBZ 1910	15.92	21	0	37.59	9	0	16.52	21	0	33.96	13	0	33.90	18	0
17	HBL867	NHGBZ 1901	25.67	7	0	32.46	17	0	24.33	14	0	31.37	17	0	37.27	16	0
18	HBL868	NHGBZ 1904	13.28	22	0	40.46	5	0	20.86	17	0	32.92	15	0	28.99	21	0
19	HBL113(C)	NHGBZ 1912	30.98	3	1	36.08	10	0	25.64	12	0	44.64	3	0	39.34	10	0
20	BHS352(C)	NHGBZ 1906	24.15	11	0	29.74	20	0	15.91	22	0	27.92	20	0	27.69	22	0
21	VLB118(C)	NHGBZ 1916	33.26	2	1	39.55	7	0	25.22	13	0	34.46	12	0	47.88	3	1
22	BHS400(C)	NHGBZ 1921	35.53	1	1	33.67	16	0	28.50	6	0	53.69	1	1	38.04	13	0
		G.M.	**23.81**			**36.25**			**25.19**			**36.47**			**39.54**		
		S.E.(M)	1.61			1.68			0.37			2.05			2.46		
		C.D.	3.81			3.97			0.87			4.85			5.81		
		C.V.	13.55			9.27			2.93			11.25			12.44		
		DOS	26.10.2019			16.10.19			9.11.19			7.11.19			7.11.19		

Grain Yield Data (2019-20)

Trial: AVT-RF-TS **Zone: NHZ**

SN	Entry	Code	Bajaura			Shimla			Rajauri			Katrain			NHZ		
			Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
1	BHS478	NHGBZ 1902	24.84	22	0	25.89	1	1	31.04	19	0	39.27	11	0	**32.3**	12	0
2	BHS479	NHGBZ 1917	33.23	10	0	19.57	7	0	26.92	21	0	49.48	2	1	**34.6**	4	0
3	BHS480	NHGBZ 1920	31.68	12	0	20.50	5	0	26.37	22	0	43.62	6	0	**32.8**	11	0
4	BHS481	NHGBZ 1907	30.20	16	0	21.12	3	0	68.75	1	1	37.34	13	0	**36.3**	3	1
5	BHS482	NHGBZ 1908	37.73	5	0	19.25	8	0	58.05	2	0	34.64	15	0	**36.4**	2	1
6	UPB1083	NHGBZ 1915	42.00	2	1	15.82	18	0	27.43	20	0	45.76	4	0	**30.7**	16	0
7	UPB1084	NHGBZ 1911	29.66	17	0	17.26	13	0	32.41	17	0	30.92	19	0	**28.4**	18	0
8	UPB1085	NHGBZ 1905	31.21	13	0	15.95	17	0	35.14	12	0	41.20	7	0	**33.8**	8	0
9	VLB165	NHGBZ 1922	43.09	1	1	17.29	12	0	43.48	6	0	39.89	10	0	**34.1**	7	0
10	VLB166	NHGBZ 1903	29.66	17	0	18.06	10	0	35.20	11	0	38.30	12	0	**31.5**	14	0
11	VLB167	NHGBZ 1918	33.77	8	0	15.45	19	0	42.26	7	0	40.92	8	0	**31.2**	15	0
12	VLB168	NHGBZ 1914	38.04	4	0	20.65	4	0	46.28	4	0	40.86	9	0	**34.1**	6	0
13	VLB169	NHGBZ 1909	33.31	9	0	19.95	6	0	35.76	9	0	31.61	17	0	**32.1**	13	0
14	HBL864,	NHGBZ 1919	31.06	14	0	17.02	14	0	33.89	14	0	31.95	16	0	**27.1**	20	0
15	HBL865	NHGBZ 1913	32.22	11	0	16.15	15	0	46.24	5	0	31.12	18	0	**33.1**	10	0
16	HBL866	NHGBZ 1910	27.41	21	0	13.53	21	0	32.21	18	0	25.95	20	0	**26.3**	21	0
17	HBL867	NHGBZ 1901	35.40	7	0	17.47	11	0	35.21	10	0	36.44	14	0	**30.6**	17	0
18	HBL868	NHGBZ 1904	28.26	20	0	16.02	16	0	33.07	16	0	20.15	21	0	**26.0**	22	0
19	HBL113(C)	NHGBZ 1912	35.48	6	0	18.56	9	0	33.87	15	0	46.58	3	0	**34.6**	5	0
20	BHS352(C)	NHGBZ 1906	38.12	3	0	14.51	20	0	47.26	3	0	19.53	22	0	**27.2**	19	0
21	VLB118(C)	NHGBZ 1916	30.67	15	0	12.84	22	0	34.38	13	0	44.38	5	0	**33.6**	9	0
22	BHS400(C)	NHGBZ 1921	28.80	19	0	24.26	2	0	35.83	8	0	50.17	1	1	**36.5**	1	1
		G.M.	32.99			18.05			38.23			37.28			**32.0**		
		S.E.(M)	1.31			0.20			1.98			0.91			**0.525**		
		C.D.	3.08			0.46			4.67			2.17			**1.2**		
		C.V.	7.92			2.17			10.33			4.25					
		DOS	1.11.2019			8.11.19			20.11.19			9.11.19					

Summary of ancillary and disease data (Rabi 2019-20)

Advance Varietal Trial –RF-TS **ZONE: NHZ**

SN	ENTRY	Code	AGRONOMIC CHARACTERS (Mean & Range)						GRAIN CHARACTERISTICS			Disease reaction		
			H. days	M. days	Height (cm)	Tillering per meter	SL (cm)	2/6 Row	Colour	1000 g.w (g)	H/N	Rust		Leaf Blight
												YR	LR	
1	BHS478	NHGBZ 1902	126 (106-154)	169 (110-193)	105 (86-127)	123 (64-273)	-	6	Y	45 (38-52)	H	-		
2	BHS479	NHGBZ 1917	116 (96-145)	165 (106-189)	104 (83-126)	121 (49-302)	-	6	Y	42 (34-47)	H	-		
3	BHS480	NHGBZ 1920	117 (88-145)	166 (105-193)	96 (73-115)	119 (54-307)	-	6	Y	43 (38-50)	H	-		
4	BHS481	NHGBZ 1907	126 (106-148)	171 (125-193)	102 (79-123)	132 (73-351)	-	6	Y	41 (35-46)	H	-		
5	BHS482	NHGBZ 1908	117 (93-142)	166 (120-187)	95 (80-112)	118 (55-312)	-	6	Y	43 (35-55)	H	-		
6	UPB1083	NHGBZ 1915	112 (91-145)	163 (107-193)	90 (68-114)	123 (60-312)	-	6	Y	40 (36-50)	H	-		
7	UPB1084	NHGBZ 1911	113 (86-143)	166 (111-193)	90 (72-110)	124 (58-362)	-	6	Y	40 (35-48)	H	-		
8	UPB1085	NHGBZ 1905	113 (91-142)	164 (115-187)	100 (81-115)	124 (66-335)	-	6	Y	39 (33-45)	H	TS		
9	VLB165	NHGBZ 1922	115 (94-144)	163 (115-187)	98 (70-113)	121 (52-328)	-	6	A	40 (36-45)	N	5S		
10	VLB166	NHGBZ 1903	121 (98-150)	168 (112-193)	95 (79-118)	121 (58-332)	-	6	A	36 (23-43)	N	-		
11	VLB167	NHGBZ 1918	116 (97-144)	166 (112-187)	96 (82-115)	119 (45-317)	-	6	A	41 (33-47)	N	15S		
12	VLB168	NHGBZ 1914	115 (87-144)	165 (116-185)	95 (80-114)	111 (50-302)	-	6	Y	37 (31-41)	H	-		
13	VLB169	NHGBZ 1909	120 (100-143)	165 (112-185)	96 (69-122)	150 (79-425)	-	2	Y	42 (35-47)	H	10S		
14	HBL864,	NHGBZ 1919	115 (94-143)	165 (109-190)	101 (85-123)	110 (47-289)	-	6	Y	40 (36-45)	H	20S		
15	HBL865	NHGBZ 1913	121 (102-147)	167 (115-189)	102 (81-118)	143 (77-380)	-	2	Y	43 (38-51)	H	5S		
16	HBL866	NHGBZ 1910	118 (99-143)	166 (108-188)	100 (89-119)	125 (42-360)	-	6	Y	38 (32-44)	H	-		
17	HBL867	NHGBZ 1901	117 (99-142)	165 (114-185)	100 (77-121)	125 (52-337)	-	6	Y	38 (35-46)	H	-		
18	HBL868	NHGBZ 1904	122 (104-143)	169 (110-192)	91 (65-122)	129 (55-319)	-	6	Y	39 (34-51)	H	-		
19	HBL113 (C)	NHGBZ 1912	124 (106-147)	168 (110-191)	101 (72-125)	151 (76-411)	-	2	Y	42 (35-49)	H	-		
20	BHS352 (C)	NHGBZ 1906	118 (95-146)	164 (118-189)	98 (84-119)	109 (43-282)	-	6	A	41 (38-47)	N	-		
21	VLB118 (C)	NHGBZ 1916	116 (95-145)	164 (109-188)	97 (71-114)	119 (41-300)	-	6	Y	42 (32-53)	H	TS		
22	BHS 400 (C)	NHGBZ 1921	121 (104-146)	167 (113-193)	100 (77-117)	127 (64-308)	-	6	Y	39 (31-50)	H	-		

Rejected trials after analysis

	AVT-SAL-ALK-IR Rampura						IVT/AVT-HLS Morena				
SN	**Varieties**	**Code**	**Yield**	**Rk**	**G**	**SN**	**Varieties**	**Code**	**Yield**	**Rk**	**G**
1	BH1032	AVT-SAL-ALK-IR-12	52.4	12	0	1	KB1843	IVT/AVT-HL-3	26.8	10	0
2	BH1033	AVT-SAL-ALK-IR-5	48.5	15	0	2	KB1848	IVT/AVT-HL-8	35.6	4	0
3	KB1822	AVT SAL-ALK-IR-10	64.0	3	1	3	DWRB204	IVT/AVT-HL-2	49.5	1	1
4	KB1815	AVT-SAL-ALK-IR-16	51.8	13	0	4	DWRB216	IVT/AVT-HL-6	35.4	5	0
5	KB1845	AVT-SAL-ALK-IR-1	55.9	11	0	5	DWRB217	IVT/AVT-HL-10	32.4	8	0
6	HUB273	AVT-SAL-ALK-IR-15	50.7	14	0	6	UPB1086	IVT/AVT-HL-1	44.8	2	1
7	HUB274	AVT-SAL-ALK-IR-4	62.7	4	1	7	Karan16 (C)	IVT/AVT-HL-5	37.4	3	1
8	NDB1730	AVT-SAL-ALK-IR-9	60.5	6	0	8	NDB943(C)	IVT/AVT-HL-9	32.0	9	0
9	NDB1742	AVT-SAL-ALK-IR-11	73.0	1	1	9	K1149 (C)	IVT/AVT-HL-7	33.9	6	0
10	DWRB214	AVT-SAL-ALK-IR-2	59.4	8	0	10	PL891(I)	IVT/AVT-HL-4	33.2	7	0
11	RD3015	AVT-SAL-ALK-IR-17	48.4	16	0			G.M.	36.1		
12	RD3016	AVT-SAL-ALK-IR-13	56.8	10	0			S.E.(M)	5.07		
13	RD3017	AVT-SAL-ALK-IR-3	44.8	17	0			C.D.	12.2		
14	RD3018	AVT-SAL-ALK-IR-7	57.8	9	0			**C.V.**	**28.1**		
15	RD2552 (C)	AVT-SAL-ALK-IR-18	38.9	18	0			DOS	21.11.2019		
16	NDB1173 (C)	AVT-SAL-ALK-IR-14	61.3	5	1						
17	RD2794 (C)	AVT-SAL-ALK-IR-6	65.5	2	1						
18	RD2907 (C)	AVT-SAL-ALK-IR-8	60.5	7	0						
		G.M.	**56.3**	**UR**							
		S.E.(M)	5.0								
		C.D.	11.9								
		C.V.	17.8								
		DOS	20.11.2019								

Rejected trials after analysis

IVT-IR-FB-Kalyani						AVT- RF-NHZ- Ranichauri					
SN	**Variety**	**Code**	**Yield**	**RK**	**G**	**SN**	**Entry**	**Code**	**Yield**	**Rk**	**G**
1	KB1816	IVT-IRFB-E6	24.3	10	0	1	BHS478	NHZB-02	14.7	10	0
2	KB1817	IVT-IRFB-E23	25.7	5	0	2	BHS479	NHZB-17	16.0	7	0
3	KB1822	IVT-IRFB-E5	20.8	18	0	3	BHS480	NHZB-20	13.3	13	0
4	HUB271	IVT-IRFB-E16	30.1	2	1	4	BHS481	NHZB-07	12.8	14	0
5	HUN272	IVT-IRFB-E25	29.0	3	1	5	BHS482	NHZB-08	14.0	12	0
6	NDB1738	IVT-IRFB-E4	19.9	22	0	6	UPB1083	NHZB-15	18.6	5	0
7	BH1029	IVT-IRFB-E14	20.2	21	0	7	UPB1084	NHZB-11	9.3	22	0
8	BH1030	IVT-IRFB-E24	16.2	25	0	8	UPB1085	NHZB-05	20.0	3	0
9	BH1031	IVT-IRFB-E22	20.5	20	0	9	VLB165	NHZB-22	11.3	18	0
10	RD3011	IVT-IRFB-E3	32.3	1	1	10	VLB166	NHZB-03	10.0	19	0
11	RD3012	IVT-IRFB-E19	25.0	7	0	11	VLB167	NHZB-18	15.9	8	0
12	RD3013	IVT-IRFB-E11	23.7	11	0	12	VLB168	NHZB-14	24.2	1	1
13	RD3014	IVT-IRFB-E2	27.9	4	0	13	VLB169	NHZB-09	15.4	9	0
14	UPB1087	IVT-IRFB-E13	25.7	6	0	14	HBL864,	NHZB-19	16.6	6	0
15	UPB1088	IVT-IRFB-E7	20.8	19	0	15	HBL865	NHZB-13	21.4	2	0
16	PL911	IVT-IRFB-E15	24.7	9	0	16	HBL866	NHZB-10	14.6	11	0
17	PL915	IVT-IRFB-E1	21.8	14	0	17	HBL867	NHZB-01	9.5	20	0
18	PL917	IVT-IRFB-E10	21.0	17	0	18	HBL868	NHZB-04	11.9	17	0
19	PL920	IVT-IRFB-E21	21.6	16	0	19	HBL113 (C)	NHZB-12	18.6	4	0
20	DWRB215	IVT-IRFB-E17	21.9	13	0	20	BHS352 (C)	NHZB-06	12.7	15	0
21	BH 946 (C)	IVT-IRFB-E8	18.4	23	0	21	VLB118 (C)	NHZB-16	9.3	21	0
22	RD2552 (C)	IVT-IRFB-E12	24.8	8	0	22	BHS400 (C)	NHZB-21	12.2	16	0
23	DWRB137 (C)	IVT-IRFB-E18	16.7	24	0			**G.M.**	**14.7**		
24	RD2899 (C)	IVT-IRFB-E20	23.5	12	0			S.E.(M)	0.9		
25	BH902 (C)	IVT-IRFB-E9	21.7	15	0			C.D.	2.2		
		GM	**23.1**					C.V.	12.7		
		S.E. (M)=	1.7					DOS	14.11.19		
		C.D. = (5%)	4.3								
		C.V. =	10.6								
		D.O.S. =	24.11.19								

International Trials and Nurseries

During *Rabi* 2019-20 season two international yield trials and two observation nurseries were supplied from ICARDA which included a total of 390 genotypes for different production conditions. These international trials and nurseries were evaluated at different selected locations. One set each of these nurseries and trials was also evaluated at ICAR-IIWBR, Karnal. Due to pandemic of corona-virus the Field Day which is organized every year to give opportunity to barley breeders of NARS to select material from these nurseries as to cater their local needs could not be organized. In addition, one set each of EIBGN (75 entries) and NBGSN (15 entries), was each supplied to 9-different locations.

International trials and nurseries evaluated during crop season 2019-2020

SN	Trial/Nursery	Genotypes	Check	# Sets	Locations
1	IBYT-HI-20	24	BH946	4	Durgapura, Hisar, Ludhiana, Karnal
2	7thGSBYT-20	24	K603	4	Hisar, Pantnagar, Kanpur, Karnal
3	IBON-HI-20	160	BH946	4	Durgapura, Pantnagar, Ludhiana, Karnal
4	7thGSBON-20	180	Lakhan	4	Kanpur, Faizabad, Bajaura, Karnal

International Barley Yield Trial-High Input-2019-20 (IBYT-HI-2019-20)

This trial comprising of 25 entries including one National check variety BH946, was evaluated in an Alpha-Lattice Design with two replications at four locations namely, Durgapura, Hisar, Karnal and Ludhiana in north western plains zone (NWPZ) under high input conditions. Ludhiana centre did not report data as Covid-19 related lockdown prevented data recording at crucial crop stage. The entry IBYT-HI-2020-6 ranked first (52.4 q/ha) followed by entries IBYT-HI-2020-13 (50.0 q/ha) and IBYT-HI-2020-11 (48.6q/ha) in the first non-significant group. The national check BH946 ranked fourth (46.6q/ha) indicating that only above three entries were better than it.

International Barley Observation Nursery-High Input-2019-20 (IBON-HI-2019-20)

The IBON comprising of 160 entries including one local check (BH946), repeated eight times, were raised at four locations namely, Durgapura, Pantnagar, Ludhiana, Karnal in *rabi* 2019-20. Ludhiana centre did not report data as it could not be recorded. The range and means for ancillary characters and grain yields (worked out as kg/ha from plot size 1.15 m^2) across the test locations. Grain yield in the check variety BH946 ranged from 1600 kg to 5200 kg/ha with a mean of 3367 kg/ha. ***In all 21 test entries recorded higher yields over the national check BH946***. Highest grain yield (4062 kg/ha) was observed in the line IBON-HI-89 followed by IBON-HI-25, IBON-HI-31, IBON-HI-28, IBON-HI-12, IBON-HI-10, IBON-HI-48, IBON-HI-94, IBON-HI-155, IBON-HI-51, IBON-HI-50, IBON-HI-6, IBON-HI-3, IBON-HI-15, IBON-HI-71, IBON-HI-49, IBON-HI-64, IBON-HI-4, IBON-HI-20, IBON-HI-9, and IBON-HI-104, respectively.

Grain yield (q/ha), barley genotypes in IBYT-HI at different locations in *rabi* 2019-20

Entry	Durgapura			Hisar			Karnal			NWPZ*		
	GY	**Rk**	**G**	**GY**	**Rk**	**G**	**GY**	**Rk**	**G**	**GY**	**Rk**	**G**
IBYT-HI-1	43.3	24	0	54.3	3	1	31.8	1	1	**43.1**	9	0
IBYT-HI-2	42.0	25	0	47.5	7	0	20.9	12	0	**36.8**	24	0
IBYT-HI-3	51.8	22	0	45.5	9	0	25.4	5	0	**40.9**	17	0
IBYT-HI-4	71.8	6	1	33.8	21	0	24.2	8	0	**43.3**	8	0
IBYT-HI-5	61.9	18	0	31.2	22	0	24.2	7	0	**39.1**	21	0
IBYT-HI-6	72.3	4	1	56.7	1	1	28.3	3	1	**52.4**	1	1
IBYT-HI-7	71.1	7	1	40.3	17	0	15.9	22	0	**42.4**	12	0
IBYT-HI-8	60.9	19	0	36.5	20	0	20.5	14	0	**39.3**	20	0
IBYT-HI-9	62.7	15	0	42.8	12	0	11.7	25	0	**39.1**	22	0
IBYT-HI-10	64.2	13	0	40.2	18	0	15.5	24	0	**39.9**	18	0
IBYT-HI-11	78.8	1	1	37.5	19	0	29.4	2	1	**48.6**	3	1
IBYT-HI-12	65.1	10	1	49.3	6	1	20.0	16	0	**44.8**	6	0
IBYT-HI-13	74.5	3	1	55.3	2	1	20.3	15	0	**50.1**	2	1
IBYT-HI-14	66.7	9	1	45.2	10	0	16.9	21	0	**42.9**	10	0
IBYT-HI-15	47.9	23	0	44.3	11	0	19.2	18	0	**37.1**	23	0
IBYT-HI-16	53.2	21	0	54.2	5	1	18.5	20	0	**42.0**	14	0
IBYT-HI-17	71.9	5	1	28.7	24	0	23.9	9	0	**41.5**	16	0
IBYT-HI-18	70.1	8	1	40.7	15	0	24.9	6	0	**45.2**	5	0
IBYT-HI-19	62.7	14	0	42.5	13	0	19.8	17	0	**41.6**	15	0
IBYT-HI-20	76.2	2	1	29.3	23	0	26.7	4	0	**44.1**	7	0
IBYT-HI-21	64.5	12	1	41.8	14	0	21.2	11	0	**42.5**	11	0
IBYT-HI-22	58.3	20	0	28.5	25	0	22.9	10	0	**36.6**	25	0
IBYT-HI-23	61.9	17	0	46.0	8	0	18.8	19	0	**42.2**	13	0
IBYT-HI-24	62.2	16	0	40.5	16	0	15.6	23	0	**39.4**	19	0
BH946 (Check)	65.0	11	1	54.3	3	1	20.6	13	0	**46.6**	4	0
GM	63.2			42.7			21.5			**42.5**		
SE (M)	5.9			3.4			1.9			**2.4**		
CD	14.3			8.3			4.6			**5.6**		
C.V.	13.3			11.4			12.5			**--**		
DOS	11.11.19			15.11.19			17.11.19					

**The trial at PAU Ludhiana could not be recorded because of Covid-19 related issue*

Mean and range for ancillary characters of entries in IBYT-HI in *rabi* 2019-20

Entry	DHA	DMA	PH (cm)	1000-gw (g)
IBYT-HI -1	95 (77-104)	131 (120-140)	111 (101-125)	37 (34-41)
IBYT-HI -2	93 (73-100)	130 (124-134)	104 (96-112)	34 (26-45)
IBYT-HI -3	90 (72-100)	127 (117-137)	109 (98-118)	36 (29-45)
IBYT-HI -4	89 (71-107)	127 (116-136)	113 (98-125)	48 (41-53)
IBYT-HI -5	88 (72-100)	127 (117-136)	109 (95-118)	46 (38-54)
IBYT-HI -6	91 (76-100)	130 (123-138)	103 (86-121)	40 (32-53)
IBYT-HI -7	93 (77-101)	126 (116-133)	111 (104-121)	38 (32-45)
IBYT-HI -8	91 (69-109)	130 (116-140)	104 (87-116)	42 (34-49)
IBYT-HI -9	89 (74-100)	127 (115-137)	101 (84-109)	38 (27-54)
IBYT-HI -10	90 (73-103)	126 (116-135)	107 (98-113)	39 (34-43)
IBYT-HI -11	89 (72-100)	126 (116-137)	105 (97-120)	42 (40-46)
IBYT-HI -12	97 (85-103)	130 (124-137)	107 (102-111)	36 (34-42)
IBYT-HI -13	98 (94-102)	133 (128-139)	111 (103-120)	34 (26-45)
IBYT-HI -14	94 (73-103)	132 (124-140)	111 (101-130)	34 (28-42)
IBYT-HI -15	93 (77-103)	128 (120-135)	112 (101-121)	36 (29-44)
IBYT-HI -16	91 (75-107)	352 (119-1033)	112 (96-123)	35 (31-39)
IBYT-HI -17	93 (78-100)	128 (117-135)	109 (104-114)	40 (35-44)
IBYT-HI -18	92 (75-100)	130 (123-137)	109 (96-130)	39 (30-44)
IBYT-HI -19	90 (72-100)	127 (114-140)	109 (101-116)	40 (32-50)
IBYT-HI -20	96 (74-109)	131 (120-138)	104 (95-115)	37 (28-48)
IBYT-HI -21	90 (73-103)	128 (116-137)	104 (97-115)	42 (36-45)
IBYT-HI -22	92 (74-100)	130 (123-138)	106 (91-124)	39 (33-43)
IBYT-HI -23	89 (72-103)	127 (118-136)	106 (98-114)	36 (32-41)
IBYT-HI -24	96 (85-104)	131 (123-139)	111 (105-121)	37 (33-44)
IBYT-HI-25 **BH946 (Check)**	91 (74-109)	128 (119-137)	103 (90-114)	39 (35-43)

Mean and range (in parenthesis) for ancillary traits of IBON-HI entries at different locations in *rabi* 2019-20

SN	Entry	DHA	DMA	PH (cm)	1000-gw (g)	Grain Yield g/plot (1.5 m2)
1	IBON-HI-2	93 (84-102)	133 (121-142)	101 (98-104)	50 (47-51)	2827 (1600-3453)
2	IBON-HI-3	89 (76-102)	135 (123-146)	97 (90-103)	39 (35-40)	3076 (2000-4467)
3	IBON-HI-4	87 (74-102)	132 (117-142)	96 (88-103)	47 (38-56)	3396 (1267-6133)
4	IBON-HI-5	94 (86-104)	133 (116-144)	97 (97-97)	39 (36-44)	2053 (1533-2440)
5	IBON-HI-6	95 (85-102)	136 (123-147)	97 (96-98)	42 (39-47)	3607 (2333-5053)
6	IBON-HI-7	87 (74-102)	132 (114-144)	95 (92-97)	49 (46-52)	3109 (2133-4273)
7	IBON-HI-8	86 (73-102)	134 (116-148)	96 (93-99)	51 (45-55)	3131 (2933-3360)
8	IBON-HI-9	88 (75-102)	134 (117-147)	100 (96-104)	32 (31-33)	3393 (2880-3833)
9	IBON-HI-10	90 (72-102)	134 (116-150)	96 (93-98)	36 (34-39)	3758 (2493-4580)
10	IBON-HI-11	104 (92-111)	142 (129-158)	99 (99-99)	45 (42-48)	3120 (2133-4480)
11	IBON-HI-12	100 (86-108)	138 (119-157)	84 (83-85)	43 (38-51)	3778 (3200-4427)
12	IBON-HI-13	98 (86-105)	137 (124-150)	88 (85-91)	45 (40-50)	1922 (1453-2267)
13	IBON-HI-14	103 (87-118)	138 (121-154)	90 (89-90)	36 (29-41)	2224 (1533-3207)
14	IBON-HI-15	98 (91-102)	138 (125-152)	96 (91-101)	48 (43-56)	3471 (2733-4627)
15	IBON-HI-16	84 (70-97)	132 (117-143)	103 (102-104)	48 (39-60)	3104 (2273-3973)
16	IBON-HI-17	90 (73-102)	134 (117-147)	103 (101-105)	37 (31-41)	3007 (2340-4080)
17	IBON-HI-18	87 (73-102)	133 (119-142)	107 (103-111)	43 (37-47)	3067 (2267-3693)
18	IBON-HI-19	88 (73-102)	133 (116-146)	105 (100-110)	38 (38-39)	2918 (1933-3667)
19	IBON-HI-20	83 (70-97)	133 (117-142)	97 (90-103)	53 (52-54)	3396 (2067-4467)
20	IBON-HI-21	84 (71-97)	132 (117-143)	102 (101-102)	50 (49-51)	3129 (1733-3880)
21	IBON-HI-22	86 (70-104)	132 (116-142)	102 (100-103)	48 (42-53)	2918 (1933-4027)
22	IBON-HI-23	90 (73-102)	134 (117-147)	98 (95-100)	40 (34-43)	2620 (2380-2800)
23	IBON-HI-24	91 (77-102)	136 (120-151)	104 (103-104)	52 (48-59)	2762 (2100-3893)
24	IBON-HI-25	85 (75-97)	134 (121-143)	97 (89-105)	41 (34-46)	4027 (2867-5160)
25	IBON-HI-26	84 (72-97)	132 (116-144)	105 (103-107)	41 (38-44)	2060 (1667-2580)
26	IBON-HI-27	88 (75-97)	135 (119-149)	99 (96-102)	48 (44-52)	2922 (2067-3827)
27	IBON-HI-28	90 (73-102)	136 (121-148)	100 (93-106)	43 (40-47)	3787 (2200-6067)
28	IBON-HI-29	103 (92-110)	140 (125-155)	106 (97-115)	41 (37-48)	2507 (1240-3747)
29	IBON-HI-30	109 (95-118)	142 (124-161)	91 (90-91)	45 (43-49)	3276 (1733-5187)
30	IBON-HI-31	87 (72-102)	133 (117-143)	94 (91-96)	40 (39-42)	3958 (2667-5940)
31	IBON-HI-32	85 (69-102)	134 (116-145)	98 (97-98)	53 (50-56)	3589 (1933-5340)
32	IBON-HI-33	86 (70-102)	134 (118-145)	98 (96-99)	51 (50-52)	2856 (2067-3740)
33	IBON-HI-34	91 (75-102)	137 (119-152)	98 (96-100)	31 (29-34)	3160 (2493-4187)
34	IBON-HI-35	87 (75-102)	134 (119-144)	105 (101-108)	45 (43-47)	3084 (1600-4933)
35	IBON-HI-37	84 (70-102)	131 (116-139)	102 (99-104)	42 (35-50)	1998 (1600-2413)
36	IBON-HI-38	90 (74-104)	134 (118-145)	100 (94-105)	38 (26-45)	2956 (2080-3520)
37	IBON-HI-39	109 (95-118)	143 (127-161)	93 (87-98)	43 (41-46)	2404 (2133-2613)
38	IBON-HI-40	106 (85-128)	142 (123-165)	106 (104-107)	30 (27-35)	3049 (2267-3773)
39	IBON-HI-41	90 (74-102)	134 (118-146)	102 (98-106)	46 (36-53)	2107 (1667-2400)
40	IBON-HI-42	90 (73-102)	133 (117-145)	101 (97-104)	39 (36-42)	2980 (2067-3567)
41	IBON-HI-43	86 (71-102)	132 (116-142)	99 (97-100)	50 (45-56)	3271 (1400-4440)
42	IBON-HI-44	85 (69-102)	132 (116-141)	97 (96-98)	51 (49-55)	2993 (1867-3680)
43	IBON-HI-45	83 (64-102)	133 (117-143)	103 (98-107)	53 (46-57)	3016 (2133-4033)
44	IBON-HI-46	97 (86-104)	137 (121-151)	100 (91-109)	46 (42-54)	3307 (2667-4227)
45	IBON-HI-47	86 (72-102)	133 (117-143)	103 (100-105)	46 (36-60)	2718 (1600-4487)
46	IBON-HI-48	92 (75-104)	138 (123-153)	103 (95-110)	38 (33-45)	3722 (2773-4660)

47	IBON-HI-49	87 (73-102)	133 (116-147)	100 (94-106)	39 (29-46)	3420 (2820-4173)
48	IBON-HI-50	88 (72-102)	135 (116-149)	100 (99-101)	34 (31-37)	3622 (2933-4053)
49	IBON-HI-51	92 (75-102)	137 (119-154)	108 (103-113)	38 (36-42)	3660 (2800-4353)
50	IBON-HI-53	104 (97-108)	143 (130-158)	106 (95-117)	46 (39-50)	2789 (2533-3073)
51	IBON-HI-54	98 (75-110)	139 (119-157)	103 (101-105)	46 (32-68)	2751 (1840-3547)
52	IBON-HI-55	89 (71-104)	135 (118-149)	101 (101-101)	52 (51-55)	3322 (1733-4700)
53	IBON-HI-56	89 (77-102)	134 (120-144)	104 (102-105)	49 (41-54)	3349 (2267-4367)
54	IBON-HI-57	92 (83-104)	135 (122-145)	100 (96-103)	40 (37-45)	2847 (2467-3220)
55	IBON-HI-58	92 (85-102)	134 (123-143)	99 (93-105)	38 (36-42)	2991 (2627-3613)
56	IBON-HI-59	91 (82-102)	134 (119-146)	111 (102-120)	42 (36-50)	2218 (1547-3373)
57	IBON-HI-60	88 (73-102)	134 (120-146)	105 (101-109)	46 (36-56)	2480 (1533-3333)
58	IBON-HI-61	87 (75-102)	134 (121-143)	106 (105-107)	51 (46-57)	2671 (1433-3560)
59	IBON-HI-62	91 (74-108)	136 (123-146)	100 (99-100)	41 (36-43)	3104 (2000-3913)
60	IBON-HI-63	97 (75-118)	137 (119-152)	101 (98-103)	40 (34-45)	2813 (2200-3227)
61	IBON-HI-64	91 (75-104)	137 (119-154)	103 (102-104)	40 (37-43)	3404 (2533-4107)
62	IBON-HI-65	88 (75-102)	135 (123-144)	101 (98-103)	42 (37-48)	2600 (1600-3160)
63	IBON-HI-66	88 (77-102)	135 (124-143)	107 (107-107)	44 (38-51)	2764 (1920-4373)
64	IBON-HI-67	89 (74-104)	135 (121-144)	102 (99-105)	47 (41-53)	2796 (1907-4280)
65	IBON-HI-68	94 (87-104)	137 (123-149)	99 (95-103)	43 (38-46)	3184 (1733-4267)
66	IBON-HI-69	95 (75-108)	135 (123-143)	100 (96-104)	40 (38-42)	2627 (1587-4227)
67	IBON-HI-70	98 (85-110)	141 (130-154)	110 (107-112)	43 (37-52)	2000 (1200-2600)
68	IBON-HI-71	98 (94-104)	137 (127-147)	112 (102-121)	45 (43-48)	3456 (2400-4087)
69	IBON-HI-72	105 (98-110)	141 (128-156)	105 (102-107)	41 (40-43)	2444 (1600-2973)
70	IBON-HI-73	86 (73-102)	133 (119-144)	104 (104-104)	53 (46-60)	2896 (2467-3320)
71	IBON-HI-74	95 (86-104)	136 (121-148)	103 (95-111)	37 (32-40)	2636 (1880-3693)
72	IBON-HI-75	90 (84-102)	135 (122-143)	101 (100-101)	56 (51-62)	2851 (1867-3367)
73	IBON-HI-76	86 (74-102)	135 (123-142)	104 (103-104)	52 (46-59)	2784 (1600-3500)
74	IBON-HI-77	87 (74-102)	135 (123-144)	102 (101-103)	50 (43-59)	2558 (2167-3307)
75	IBON-HI-78	98 (85-104)	137 (123-149)	92 (90-93)	40 (38-41)	2924 (2360-3613)
76	IBON-HI-79	102 (87-110)	139 (122-157)	108 (99-116)	38 (37-40)	1851 (1207-2400)
77	IBON-HI-81	96 (84-110)	137 (125-146)	100 (99-101)	41 (35-48)	2480 (1547-2960)
78	IBON-HI-82	106 (93-118)	144 (128-158)	100 (99-101)	39 (34-42)	2044 (1560-2867)
79	IBON-HI-83	94 (83-104)	139 (124-148)	95 (94-96)	37 (37-39)	3091 (2400-3693)
80	IBON-HI-84	105 (95-110)	144 (130-156)	114 (106-122)	43 (39-50)	2029 (1100-2853)
81	IBON-HI-85	86 (72-102)	134 (118-145)	103 (101-105)	56 (51-62)	2547 (2067-3013)
82	IBON-HI-86	100 (93-104)	141 (128-156)	103 (99-107)	37 (32-43)	2076 (1013-2733)
83	IBON-HI-87	87 (74-102)	133 (119-144)	100 (92-108)	39 (37-44)	3307 (2200-4680)
84	IBON-HI-88	99 (90-110)	138 (121-154)	96 (95-97)	42 (39-45)	2773 (2467-3173)
85	IBON-HI-89	91 (75-102)	133 (120-143)	100 (98-102)	37 (35-40)	4062 (2600-5053)
86	IBON-HI-90	99 (89-108)	139 (122-155)	107 (104-109)	42 (37-51)	2671 (1480-4333)
87	IBON-HI-91	86 (74-102)	134 (121-143)	102 (101-102)	45 (38-50)	2311 (1280-3187)
88	IBON-HI-92	86 (73-102)	133 (119-143)	101 (99-103)	52 (44-58)	2982 (2333-3867)
89	IBON-HI-93	87 (73-102)	133 (118-145)	98 (90-105)	52 (44-58)	2989 (2207-4027)
90	IBON-HI-94	94 (84-104)	135 (119-147)	101 (98-103)	45 (43-49)	3709 (2600-4533)
91	IBON-HI-96	98 (93-104)	139 (124-149)	102 (96-107)	39 (34-47)	2969 (2533-3640)
92	IBON-HI-97	86 (74-102)	132 (117-143)	104 (103-105)	58 (51-66)	3049 (1933-4440)
93	IBON-HI-98	93 (83-102)	134 (119-146)	102 (100-104)	54 (50-60)	2578 (2200-3320)
94	IBON-HI-99	87 (73-102)	132 (118-142)	108 (106-109)	53 (48-58)	3213 (2333-3840)
95	IBON-HI-100	96 (84-108)	138 (122-152)	108 (101-115)	40 (36-46)	2007 (1033-2600)

96	IBON-HI-101	86 (73-102)	135 (121-145)	98 (93-102)	56 (50-64)	2724 (2400-3320)
97	IBON-HI-102	94 (84-104)	136 (124-146)	97 (93-100)	46 (43-49)	2489 (1933-3387)
98	IBON-HI-103	87 (73-102)	135 (119-146)	105 (102-107)	37 (33-44)	2996 (2453-3867)
99	IBON-HI-104	87 (74-102)	134 (119-143)	98 (93-103)	52 (49-57)	3389 (2400-3947)
100	IBON-HI-105	91 (75-104)	135 (118-148)	101 (98-104)	42 (39-49)	3169 (2493-3813)
101	IBON-HI-106	87 (74-102)	133 (119-144)	100 (99-100)	48 (46-51)	2996 (1533-3880)
102	IBON-HI-107	86 (73-102)	134 (121-143)	100 (94-105)	49 (41-59)	2609 (1867-3693)
103	IBON-HI-108	86 (71-102)	133 (117-145)	102 (97-107)	56 (47-63)	2973 (2427-4027)
104	IBON-HI-109	98 (66-118)	145 (124-165)	94 (92-95)	43 (40-47)	2298 (1360-2800)
105	IBON-HI-110	97 (84-110)	138 (123-147)	102 (99-105)	45 (43-47)	2427 (680-4400)
106	IBON-HI-111	96 (84-108)	137 (122-146)	101 (95-107)	45 (45-47)	3024 (2133-4213)
107	IBON-HI-112	98 (86-108)	139 (121-156)	95 (92-97)	40 (37-42)	1613 (1093-2000)
108	IBON-HI-113	90 (75-102)	136 (125-145)	110 (104-115)	50 (50-51)	3142 (2200-4160)
109	IBON-HI-114	104 (96-110)	141 (127-156)	102 (100-103)	40 (38-40)	2333 (2027-2573)
110	IBON-HI-115	91 (83-104)	136 (119-144)	105 (104-105)	43 (42-45)	3209 (2733-3747)
111	IBON-HI-116	95 (86-104)	138 (124-149)	106 (105-106)	37 (34-39)	2364 (1387-3440)
112	IBON-HI-117	96 (86-110)	140 (124-150)	104 (98-110)	41 (37-44)	2147 (1867-2440)
113	IBON-HI-118	92 (84-102)	134 (118-146)	100 (99-100)	46 (40-50)	2222 (1933-2653)
114	IBON-HI-119	87 (75-102)	133 (119-142)	96 (95-97)	44 (38-53)	2564 (2000-2987)
115	IBON-HI-121	95 (86-104)	136 (124-147)	105 (102-107)	50 (43-55)	3018 (1533-4093)
116	IBON-HI-123	90 (83-102)	135 (123-144)	105 (103-107)	55 (46-62)	2269 (2060-2613)
117	IBON-HI-124	100 (86-118)	137 (122-148)	99 (94-103)	39 (34-45)	2511 (2200-2800)
118	IBON-HI-125	83 (72-102)	133 (120-144)	97 (93-100)	46 (37-53)	2953 (2200-3513)
119	IBON-HI-126	107 (96-118)	144 (130-157)	94 (89-98)	39 (38-40)	2773 (2093-3493)
120	IBON-HI-127	99 (85-118)	137 (124-147)	100 (93-107)	44 (41-46)	2822 (2533-3320)
121	IBON-HI-128	104 (96-110)	142 (125-157)	113 (104-122)	42 (41-42)	2567 (2493-2607)
122	IBON-HI-129	87 (75-102)	134 (119-147)	96 (96-96)	42 (39-46)	2047 (1800-2480)
123	IBON-HI-130	85 (73-102)	131 (118-138)	101 (95-107)	51 (42-60)	2920 (2067-3653)
124	IBON-HI-131	97 (86-108)	137 (122-148)	103 (101-104)	35 (30-37)	2993 (2400-3447)
125	IBON-HI-132	91 (85-102)	134 (121-143)	99 (98-99)	43 (38-51)	2387 (1933-2853)
126	IBON-HI-133	92 (75-104)	136 (121-149)	97 (94-100)	41 (31-48)	1753 (887-2973)
127	IBON-HI-134	88 (74-104)	134 (118-145)	91 (89-93)	35 (32-37)	2369 (2200-2493)
128	IBON-HI-135	89 (77-104)	134 (118-146)	98 (96-100)	41 (34-48)	2551 (1600-3533)
129	IBON-HI-136	97 (85-110)	139 (120-151)	96 (95-97)	40 (38-43)	3076 (2733-3640)
130	IBON-HI-137	95 (77-118)	137 (124-147)	105 (101-108)	41 (34-46)	2809 (2587-3000)
131	IBON-HI-138	91 (76-102)	133 (118-143)	102 (99-105)	40 (35-42)	3009 (2520-3973)
132	IBON-HI-139	86 (74-102)	132 (117-142)	101 (97-104)	40 (34-43)	3044 (2573-3560)
133	IBON-HI-140	85 (71-102)	132 (116-143)	103 (103-103)	57 (52-62)	2851 (2447-3533)
134	IBON-HI-141	86 (71-102)	132 (115-145)	106 (102-110)	52 (48-58)	2520 (1787-2933)
135	IBON-HI-142	90 (74-102)	134 (118-147)	98 (95-101)	38 (35-40)	2391 (1240-3133)
136	IBON-HI-143	94 (74-118)	137 (119-146)	104 (95-112)	32 (29-38)	2313 (993-3133)
137	IBON-HI-144	98 (90-104)	138 (124-153)	100 (97-103)	38 (29-45)	2164 (693-3200)
138	IBON-HI-145	87 (75-102)	134 (120-144)	101 (99-103)	47 (44-54)	2113 (1887-2267)
139	IBON-HI-146	86 (72-102)	133 (116-145)	100 (98-101)	52 (46-58)	3251 (2800-3507)
140	IBON-HI-147	108 (97-118)	139 (124-153)	109 (106-111)	42 (39-44)	2609 (2200-2933)
141	IBON-HI-148	86 (73-102)	134 (119-145)	105 (103-106)	49 (43-54)	2909 (2233-3760)
142	IBON-HI-149	98 (86-110)	137 (124-146)	105 (102-107)	38 (30-47)	2100 (1020-2733)
143	IBON-HI-150	93 (75-110)	136 (121-147)	102 (99-104)	38 (31-43)	2911 (1533-4067)
144	IBON-HI-151	87 (73-104)	134 (121-143)	99 (98-100)	41 (33-47)	2524 (1507-3200)

145	IBON-HI-152	93 (83-104)	137 (123-150)	103 (102-104)	45 (31-53)	1736 (833-2240)
146	IBON-HI-153	105 (95-110)	140 (125-157)	110 (105-114)	42 (38-49)	2033 (1460-2573)
147	IBON-HI-154	96 (73-118)	136 (120-147)	101 (99-103)	38 (33-44)	2371 (1127-3133)
148	IBON-HI-155	88 (74-104)	134 (119-145)	101 (96-106)	34 (30-37)	3684 (2960-5093)
149	IBON-HI-156	93 (76-110)	138 (123-151)	97 (94-100)	42 (40-44)	2633 (1393-3773)
150	IBON-HI-158	99 (91-110)	137 (121-149)	108 (103-113)	37 (34-41)	2520 (1040-3720)
151	IBON-HI-159	87 (73-104)	134 (119-144)	104 (102-105)	51 (46-55)	2489 (1840-3493)
152	IBON-HI-160	87 (74-102)	134 (118-145)	108 (106-109)	52 (45-59)	2867 (1493-4640)
BH946 (Check), 1,36,52, 80,95,120, 122,157		93 (73-104)	139 (117-157)	102 (95-115)	42 (33-55)	3367 (1600-5200)

7th Global Spring Barley Yield Trial-2019 (7th GSBYT-2019)

This trial comprised of 25 including check variety K603 and was evaluated at three locations (Karnal, Hisar and Pantnagar) in NWPZ and one location (Kanpur) in NEPZ under low input production conditions. In NWPZ the entry 7th GSBYT-2019-14 ranked first with 39 q/ha grain yield followed 15 more entries in the first NSG, while only seven entries ranked above national check K603. In NEPZ (Kanpur) the highest grain yield was recorded in the entry 7th GSBYT-2019-22, which was followed by GSBYT-2019-11, GSBYT-2019-3 and check K603, though eight more entries were in the first non-significant group. Over all the entry 7th GSBYT-2019-11 ranked first followed by two more entries (15 & 10), higher than check K603, while five more entries fell in the first NSG in this trial.

Grain yield (q/ha) of barley entries in 7th GSBYT at different locations in *rabi* 2019-20

Entry	Hisar			Karnal			Pantnagar			NWPZ			Kanpur			Overall		
	GY	Rk	G	GY	Rk	G	GY	Rk	G	GY	Rk	G	GY	Rk	G	GY	Rk	G
GSBYT -1	42.0	12	0	21.8	4	0	28.4	24	0	**30.7**	18	0	50.4	3	1	**35.6**	14	0
GSBYT -2	48.2	7	1	21.2	5	0	45.4	6	1	**38.3**	3	1	32.9	24	0	**36.9**	11	0
GSBYT -3	47.2	9	0	19.9	11	0	30.5	22	0	**32.5**	16	1	41.7	13	0	**34.8**	17	0
GSBYT -4	52.7	3	1	23.6	2	0	31.7	18	0	**36.0**	10	1	45.4	10	1	**38.4**	6	1
GSBYT -5	44.0	11	0	20.5	9	0	42.7	9	1	**35.7**	12	1	47.9	6	1	**38.8**	5	1
GSBYT -6	40.2	15	0	20.9	6	0	32.9	15	0	**31.3**	17	0	43.3	12	1	**34.3**	20	0
GSBYT -7	42.0	12	0	33.0	1	1	36.8	12	1	**37.3**	6	1	30.8	25	0	**35.7**	13	0
GSBYT -8	37.7	19	0	20.0	10	0	31.2	20	0	**29.6**	19	0	48.8	5	1	**34.4**	19	0
GSBYT -9	37.0	21	0	18.5	14	0	52.4	4	1	**35.9**	11	1	45.4	11	1	**38.3**	7	1
GSBYT -10	41.8	14	0	17.4	17	0	55.7	2	1	**38.3**	2	1	46.3	8	1	**40.3**	3	1
GSBYT -11	39.2	17	0	20.8	7	0	54.8	3	1	**38.2**	4	1	60.4	2	1	**43.8**	1	1
GSBYT -12	47.3	8	1	14.1	24	0	38.3	11	1	**33.2**	15	1	41.3	15	0	**35.2**	16	0
GSBYT -13	50.5	6	1	17.5	16	0	34.3	13	0	**34.1**	14	1	35.8	20	0	**34.5**	18	0
GSBYT -14	50.8	5	1	22.2	3	0	43.0	7	1	**38.7**	1	1	35.8	20	0	**38.0**	9	1
GSBYT -15	47.2	9	0	16.2	19	0	50.6	5	1	**38.0**	5	1	47.9	7	1	**40.5**	2	1
GSBYT -16	57.0	1	1	14.6	22	0	32.4	17	0	**34.7**	13	1	45.8	9	1	**37.5**	10	1
GSBYT -17	30.3	23	0	14.5	23	0	27.3	25	0	**24.1**	25	0	41.7	14	0	**28.5**	25	0
GSBYT -18	28.8	25	0	17.3	18	0	30.9	21	0	**25.7**	24	0	40.8	18	0	**29.5**	24	0
GSBYT -19	39.3	16	0	18.6	13	0	29.2	23	0	**29.0**	20	0	40.8	17	0	**32.0**	21	0
GSBYT -20	31.0	22	0	17.7	15	0	59.8	1	1	**36.2**	9	1	37.9	19	0	**36.6**	12	0
GSBYT -21	37.3	20	0	15.6	20	0	32.4	16	0	**28.4**	22	0	35.4	22	0	**30.2**	23	0
GSBYT -22	30.2	24	0	19.6	12	0	31.5	19	0	**27.1**	23	0	60.8	1	1	**35.5**	15	0
GSBYT -23	50.8	4	1	20.7	8	0	39.5	10	1	**37.0**	7	1	41.3	15	0	**38.1**	8	1
GSBYT -24	38.2	18	0	14.7	21	0	33.3	14	0	**28.7**	21	0	35.4	23	0	**30.4**	22	0
K603(NC)	54.2	2	1	12.6	25	0	42.7	8	1	**36.5**	8	1	49.6	4	1	**39.7**	4	1
G.M.	42.6			18.9			38.7			33.4			43.4			35.9		
C.D.	5.5			4.3			19.4			6.7			18.6			6.7		
C.V.	7.5			13.1			29.3						25.1					
DOS	15.11.19			19.11.19			9.12.19											

Mean and range (in parenthesis) for ancillary traits of entries in 7th GSBYT-20

Entry	DHA	DMA	PH (cm)	1000-gw (g)
GSBYT -1	95 (91-101)	137 (133-149)	95 (70-114)	46 (42-50)
GSBYT -2	96 (89-107)	134 (126-154)	109 (92-123)	48 (46-49)
GSBYT -3	98 (83-107)	136 (130-142)	94 (83-109)	45 (41-53)
GSBYT -4	98 (91-107)	135 (130-147)	108 (95-121)	45 (40-54)
GSBYT -5	96 (89-101)	138 (131-150)	106 (76-116)	45 (38-52)
GSBYT -6	91 (85-101)	133 (126-147)	99 (85-111)	50 (47-53)
GSBYT -7	97 (87-103)	138 (130-146)	100 (90-110)	46 (41-56)
GSBYT -8	98 (89-104)	140 (138-146)	103 (95-125)	41 (34-52)
GSBYT -9	98 (86-106)	139 (138-143)	93 (73-106)	47 (42-52)
GSBYT -10	100 (96-107)	135 (129-149)	94 (85-110)	40 (33-47)
GSBYT -11	94 (90-101)	132 (126-145)	94 (80-109)	43 (41-47)
GSBYT -12	96 (82-103)	137 (132-152)	101 (72-115)	43 (39-50)
GSBYT -13	98 (93-103)	137 (131-147)	93 (82-104)	35 (23-40)
GSBYT -14	98 (89-107)	137 (132-149)	113 (77-125)	40 (36-44)
GSBYT -15	95 (90-103)	136 (130-151)	97 (75-112)	43 (36-50)
GSBYT -16	93 (85-107)	136 (133-144)	105 (78-130)	42 (36-47)
GSBYT -17	94 (85-107)	137 (133-143)	95 (72-123)	38 (33-46)
GSBYT -18	99 (93-104)	139 (134-150)	102 (67-121)	40 (36-43)
GSBYT -19	97 (91-107)	136 (132-149)	108 (67-130)	47 (42-50)
GSBYT -20	97 (86-107)	136 (130-148)	91 (73-107)	41 (36-51)
GSBYT -21	99 (90-107)	140 (135-147)	96 (82-120)	39 (34-43)
GSBYT -22	100 (93-107)	135 (129-151)	101 (68-120)	37 (34-42)
GSBYT -23	98 (95-101)	138 (130-149)	109 (100-124)	41 (35-47)
GSBYT -24	100 (91-117)	134 (125-150)	91 (72-110)	38 (34-42)
K603(Check)	99 (91-117)	138 (132-150)	108 (70-130)	40 (38-45)

7th Global Spring Barley Observation Nursery-2020 (7th GSBON-2020)

This nursery consisted of 180 entries including a national check Lakhan repeated nine times and was raised at four locations namely, Kanpur, Faizabad, Bajaura and Karnal. The range and means for ancillary characters and grain yields (worked out as kg/ha from plot size 1.15 m^2) across the test locations is tabulated below. Grain yield of check variety Lakhan ranged from 967 kg to 5833 kg /ha with a mean of 3285 kg/ha across the test locations. Only eight lines gave better grain yields over the check variety. Highest grain yield (3967 kg/ha) was observed in the line GSBON-92, followed by GSBON-88, GSBON-92, GSBON-101, GSBON-90, GSBON-18, GSBON-20 and GSBON-99, respectively.

Mean and range (in parenthesis) of 7th GSBON-(2019-20) entries for ancillary characters

SN	Entry	DHA	DMA	PH (cm)	1000-gw (g)	Grain yield (kg/ha)
1	GSBON -1	99 (80-123)	147 (118-185)	89 (65-112)	35 (34-36)	2530 (2187-3333)
2	GSBON -2	96 (77-119)	143 (112-180)	97 (76-118)	28 (19-34)	2858 (2133-3500)
3	GSBON -3	104 (88-124)	147 (123-180)	86 (67-105)	37 (32-43)	2475 (1867-3667)
4	GSBON -4	102 (76-124)	142 (112-175)	93 (81-105)	34 (29-38)	1383 (667-2000)
5	GSBON -5	96 (79-113)	144 (123-170)	93 (75-110)	30 (20-36)	1993 (1600-2440)
6	GSBON -6	104 (88-123)	143 (123-170)	95 (77-112)	27 (23-30)	2013 (940-3167)
7	GSBON -8	100 (80-123)	146 (118-180)	100 (91-109)	37 (36-38)	2060 (1273-3067)
8	GSBON -9	98 (76-121)	143 (112-180)	108 (85-130)	32 (28-35)	1800 (867-3500)
9	GSBON -10	97 (75-116)	142 (112-175)	96 (83-108)	37 (33-42)	2953 (1760-4187)
10	GSBON -11	102 (90-121)	148 (127-180)	95 (80-110)	30 (21-42)	2198 (1300-3027)
11	GSBON -12	101 (89-119)	144 (123-170)	104 (95-113)	36 (29-41)	2635 (1267-4167)
12	GSBON -13	102 (77-124)	142 (112-175)	99 (90-107)	33 (31-34)	2383 (1267-3333)
13	GSBON -14	94 (77-111)	143 (112-175)	111 (96-125)	39 (31-43)	2753 (1733-4000)
14	GSBON -15	101 (83-119)	144 (120-175)	108 (100-116)	27 (14-36)	2178 (1833-2833)
15	GSBON -16	98 (76-119)	140 (112-170)	105 (89-121)	36 (31-39)	1928 (1400-2933)
16	GSBON -17	96 (79-110)	147 (123-180)	101 (100-101)	42 (36-46)	2670 (1813-3600)
17	GSBON -18	95 (74-111)	143 (112-180)	97 (91-103)	35 (28-39)	3480 (2667-4100)
18	GSBON -19	100 (76-121)	143 (112-180)	103 (84-122)	41 (36-44)	1700 (867-2467)
19	GSBON -20	104 (83-124)	146 (120-180)	103 (96-110)	35 (26-45)	3433 (1867-5833)
20	GSBON -21	107 (82-125)	148 (120-185)	95 (78-111)	38 (36-40)	2047 (1133-2987)
21	GSBON -22	99 (77-123)	145 (112-185)	96 (83-109)	35 (26-42)	3182 (2333-5167)
22	GSBON -23	102 (88-123)	145 (123-175)	93 (79-107)	37 (36-38)	2263 (2120-2467)
23	GSBON -24	103 (81-124)	144 (120-175)	103 (96-110)	35 (35-36)	3100 (2000-5167)
24	GSBON -25	102 (79-123)	148 (120-180)	97 (81-113)	37 (36-39)	1993 (1000-3200)
25	GSBON -26	102 (77-124)	145 (112-185)	100 (96-103)	39 (38-41)	2330 (1333-3233)
26	GSBON -27	102 (74-126)	146 (115-185)	93 (75-110)	41 (34-47)	2437 (1000-3680)
27	GSBON -28	99 (74-125)	146 (115-185)	101 (94-108)	43 (42-44)	2730 (1533-3953)
28	GSBON -29	98 (74-123)	141 (115-170)	97 (86-107)	41 (36-46)	1942 (1333-3400)
29	GSBON -30	99 (79-121)	143 (118-175)	102 (95-108)	34 (31-39)	2072 (1333-2467)
30	GSBON -31	102 (79-124)	144 (118-175)	91 (78-103)	33 (30-37)	1865 (1333-2260)
31	GSBON -32	98 (80-121)	146 (118-175)	94 (88-100)	40 (34-44)	2535 (2000-3133)
32	GSBON -33	96 (80-111)	144 (118-175)	99 (92-106)	32 (27-36)	2255 (1520-3500)
33	GSBON -34	102 (78-124)	145 (110-185)	113 (102-123)	37 (32-40)	1863 (1667-2087)
34	GSBON -35	101 (81-121)	142 (118-170)	96 (91-100)	34 (32-36)	1815 (1227-2167)
35	GSBON -36	101 (78-124)	142 (110-170)	107 (96-117)	40 (36-44)	2072 (1233-2733)
36	GSBON -38	99 (80-124)	146 (118-175)	106 (94-118)	42 (40-44)	2500 (1733-3333)
37	GSBON -39	97 (77-121)	143 (110-180)	101 (85-116)	36 (31-39)	1217 (667-1800)
38	GSBON -40	101 (83-124)	150 (121-185)	96 (82-110)	37 (32-43)	3025 (1867-5000)
39	GSBON -41	103 (87-125)	150 (125-185)	87 (68-105)	40 (39-41)	2137 (800-4667)
40	GSBON -42	104 (87-124)	150 (125-185)	84 (60-107)	34 (32-36)	1435 (333-2267)
41	GSBON -43	99 (80-121)	145 (118-180)	97 (77-117)	38 (34-44)	2628 (1547-4500)
42	GSBON -44	102 (80-124)	144 (118-175)	100 (84-115)	28 (26-30)	1490 (593-2400)

43	GSBON -45	102 (80-123)	142 (118-170)	97 (90-103)	31 (28-37)	1812 (913-2733)
44	GSBON -46	97 (76-119)	140 (112-170)	100 (93-106)	31 (27-34)	1840 (960-2933)
45	GSBON -47	92 (76-112)	140 (112-170)	111 (103-118)	38 (35-42)	3117 (2400-4000)
46	GSBON -48	98 (75-119)	142 (112-175)	96 (87-105)	42 (32-48)	2575 (1667-4167)
47	GSBON -49	100 (79-124)	144 (118-175)	104 (83-125)	39 (36-42)	1310 (707-2467)
48	GSBON -50	107 (89-124)	152 (128-185)	110 (95-125)	41 (34-46)	2548 (1833-3793)
49	GSBON -51	98 (76-121)	140 (112-170)	85 (70-100)	30 (26-38)	1913 (853-2867)
50	GSBON -52	105 (76-125)	142 (112-175)	95 (84-106)	37 (32-45)	1393 (673-1900)
51	GSBON -53	99 (78-124)	144 (115-180)	90 (80-100)	41 (30-49)	2348 (1000-4333)
52	GSBON -54	98 (73-124)	142 (110-180)	105 (77-132)	34 (27-39)	945 (533-1667)
53	GSBON -55	98 (77-125)	146 (115-185)	80 (59-100)	36 (33-38)	2022 (467-3000)
54	GSBON -56	102 (81-124)	146 (118-180)	91 (75-107)	34 (28-40)	2125 (467-3000)
55	GSBON -57	103 (81-124)	146 (118-180)	96 (86-106)	41 (32-46)	3283 (833-6233)
56	GSBON -58	102 (83-124)	143 (121-170)	88 (64-111)	41 (32-49)	2353 (967-3667)
57	GSBON -59	100 (83-124)	145 (121-175)	103 (76-130)	34 (30-37)	3000 (1600-3933)
58	GSBON -61	102 (83-124)	143 (120-170)	92 (64-120)	36 (33-39)	1750 (1000-2733)
59	GSBON -62	102 (83-123)	145 (120-175)	90 (66-113)	37 (34-40)	2553 (1333-5500)
60	GSBON -63	101 (83-121)	148 (120-180)	87 (54-119)	40 (36-44)	2322 (667-5000)
61	GSBON -64	102 (83-121)	145 (120-170)	81 (56-106)	31 (27-37)	1458 (667-2667)
62	GSBON -65	97 (76-119)	144 (112-175)	82 (58-106)	42 (38-45)	1933 (1033-3333)
63	GSBON -66	98 (76-121)	143 (112-180)	88 (65-111)	38 (32-43)	2513 (667-5333)
64	GSBON -67	104 (81-119)	143 (118-175)	92 (71-113)	31 (18-39)	1260 (333-3000)
65	GSBON -68	101 (79-124)	145 (118-180)	91 (65-116)	36 (30-40)	1645 (333-2613)
66	GSBON -69	99 (76-123)	142 (112-175)	95 (80-110)	35 (28-39)	2737 (1547-3500)
67	GSBON -70	98 (76-121)	141 (112-175)	108 (85-131)	40 (34-44)	2312 (1533-3213)
68	GSBON -72	100 (80-123)	142 (118-170)	104 (96-111)	32 (28-36)	2457 (1667-3833)
69	GSBON -73	97 (80-119)	142 (118-170)	97 (80-114)	33 (25-38)	2337 (1633-2833)
70	GSBON -74	95 (80-113)	143 (118-175)	91 (73-108)	31 (28-33)	3085 (1907-5333)
71	GSBON -75	102 (80-124)	144 (118-175)	96 (69-123)	31 (25-38)	1847 (1367-2353)
72	GSBON -76	101 (75-124)	144 (112-180)	91 (65-117)	41 (32-49)	2478 (833-4667)
73	GSBON -77	98 (75-121)	144 (112-180)	91 (60-122)	39 (30-46)	1945 (467-2667)
74	GSBON -78	100 (75-124)	146 (112-180)	81 (61-101)	39 (28-49)	1513 (400-3220)
75	GSBON -79	101 (83-124)	147 (120-180)	79 (53-104)	37 (34-42)	2082 (1667-2933)
76	GSBON -80	100 (83-121)	143 (120-170)	92 (60-123)	30 (21-39)	2165 (960-3333)
77	GSBON -81	100 (83-121)	143 (120-170)	82 (52-111)	34 (33-35)	2892 (1567-5333)
78	GSBON -82	100 (83-124)	146 (120-180)	85 (58-112)	36 (32-41)	2317 (1867-2900)
79	GSBON -83	100 (77-124)	144 (112-180)	96 (82-110)	33 (27-37)	2953 (1867-4000)
80	GSBON -84	102 (79-125)	146 (118-175)	96 (83-108)	36 (31-42)	1898 (667-5000)
81	GSBON -85	99 (80-121)	146 (118-175)	93 (74-111)	32 (14-42)	1455 (800-2167)
82	GSBON -86	109 (94-125)	151 (133-180)	95 (75-114)	36 (34-40)	2365 (667-3767)
83	GSBON -88	96 (83-116)	144 (120-175)	104 (96-111)	38 (36-40)	3760 (2840-5333)
84	GSBON -89	103 (83-124)	144 (120-175)	103 (97-109)	40 (36-44)	2022 (1400-3000)
85	GSBON -90	102 (83-124)	148 (120-185)	94 (80-108)	34 (27-38)	3600 (2267-5333)
86	GSBON -91	104 (82-125)	148 (120-185)	95 (80-109)	36 (29-46)	1000 (667-1833)
87	GSBON -92	102 (88-124)	148 (125-180)	99 (94-104)	38 (29-45)	3967 (3400-5000)

88	GSBON -93	102 (80-124)	148 (118-180)	102 (101-103)	43 (38-52)	2230 (1000-3167)
89	GSBON -94	102 (83-125)	148 (120-180)	104 (100-107)	34 (19-42)	1882 (667-4000)
90	GSBON -95	103 (83-125)	150 (120-185)	111 (98-124)	33 (26-38)	2238 (1367-3333)
91	GSBON -96	103 (83-124)	148 (120-180)	97 (93-101)	32 (19-40)	2947 (1967-4333)
92	GSBON -97	104 (83-124)	144 (120-175)	103 (88-118)	31 (28-36)	1660 (373-3067)
93	GSBON -98	100 (81-123)	145 (118-180)	101 (77-124)	43 (36-52)	2250 (1233-3333)
94	GSBON -99	101 (87-121)	146 (126-175)	91 (63-119)	43 (41-47)	3295 (2000-4333)
95	GSBON -100	103 (87-123)	148 (126-180)	110 (103-117)	42 (34-50)	3102 (2040-3667)
96	GSBON -101	100 (78-121)	146 (114-180)	107 (102-111)	41 (38-43)	3627 (2907-5000)
97	GSBON -102	100 (82-121)	144 (120-175)	101 (96-106)	43 (36-53)	2182 (693-3667)
98	GSBON -103	101 (76-121)	143 (114-175)	100 (92-108)	38 (37-40)	3020 (1247-5000)
99	GSBON -104	103 (83-124)	146 (120-180)	112 (105-118)	41 (38-45)	1992 (1660-2333)
100	GSBON -105	103 (83-124)	147 (120-180)	105 (93-116)	41 (39-42)	2320 (1833-2700)
101	GSBON -106	104 (83-124)	145 (120-175)	102 (100-104)	34 (25-40)	2577 (2033-2867)
102	GSBON -107	105 (76-124)	143 (114-175)	96 (85-107)	35 (32-37)	1648 (927-2533)
103	GSBON -108	102 (76-124)	140 (114-170)	101 (82-119)	30 (29-31)	1993 (1000-2867)
104	GSBON -109	102 (82-124)	146 (120-180)	97 (88-106)	36 (29-40)	2000 (1433-2500)
105	GSBON -110	100 (82-121)	144 (120-175)	103 (80-126)	32 (23-40)	2577 (1500-3573)
106	GSBON -111	102 (82-125)	148 (120-185)	99 (72-126)	39 (35-45)	2358 (1267-2967)
107	GSBON -112	101 (82-124)	146 (120-180)	96 (90-101)	41 (34-48)	1965 (1200-3060)
108	GSBON -113	101 (80-124)	148 (120-185)	101 (95-107)	34 (31-39)	2445 (1367-4000)
109	GSBON -114	102 (80-123)	148 (120-185)	101 (101-101)	35 (33-38)	2478 (2180-2867)
110	GSBON -115	103 (90-119)	150 (138-175)	119 (105-133)	35 (29-40)	2895 (1500-4333)
111	GSBON -116	107 (88-125)	150 (126-180)	96 (90-101)	46 (38-55)	1975 (1767-2200)
112	GSBON -117	98 (79-119)	144 (120-175)	101 (93-108)	35 (33-36)	2183 (1000-4333)
113	GSBON -119	102 (79-124)	144 (120-175)	108 (103-112)	41 (32-50)	2808 (1267-5000)
114	GSBON -120	96 (79-116)	147 (120-175)	116 (101-131)	47 (42-53)	2768 (1867-4000)
115	GSBON -121	98 (79-116)	145 (123-175)	94 (77-111)	31 (30-32)	2091 (1807-2300)
116	GSBON -122	102 (90-123)	151 (128-180)	101 (81-121)	40 (34-43)	2608 (1600-5000)
117	GSBON -123	100 (88-119)	146 (126-175)	103 (95-111)	39 (35-42)	3238 (2033-5000)
118	GSBON -124	104 (89-123)	146 (126-175)	105 (92-117)	38 (35-42)	2458 (1433-4333)
119	GSBON -125	104 (89-124)	152 (126-185)	100 (95-104)	38 (36-41)	2122 (887-3667)
120	GSBON -126	99 (78-123)	140 (112-170)	90 (75-104)	37 (36-38)	2350 (667-4333)
121	GSBON -127	101 (78-121)	142 (112-175)	102 (95-109)	35 (33-39)	2158 (1733-3167)
122	GSBON -128	97 (78-116)	143 (112-180)	108 (105-111)	32 (21-44)	2242 (1333-2600)
123	GSBON -129	101 (78-121)	144 (112-180)	104 (93-114)	36 (32-39)	2717 (2200-3467)
124	GSBON -131	100 (76-121)	141 (109-175)	112 (95-129)	37 (34-39)	2507 (1900-3333)
125	GSBON -132	99 (76-124)	145 (109-185)	99 (91-107)	40 (34-46)	2392 (833-5000)
126	GSBON -133	97 (76-121)	145 (109-185)	96 (83-109)	34 (30-42)	2475 (1100-5000)
127	GSBON -134	101 (76-121)	145 (109-185)	102 (92-112)	38 (35-40)	1988 (1120-3467)
128	GSBON -135	106 (89-125)	150 (126-185)	98 (90-106)	40 (36-45)	2370 (1747-3500)
129	GSBON -136	102 (83-123)	148 (121-185)	107 (90-124)	37 (32-45)	2600 (1133-3533)
130	GSBON -137	101 (83-124)	143 (121-170)	110 (105-115)	39 (34-43)	2502 (2000-3167)
131	GSBON -138	102 (78-124)	142 (112-175)	111 (102-120)	38 (30-43)	2033 (1033-3000)
132	GSBON -139	102 (78-124)	145 (112-185)	97 (95-99)	39 (34-45)	2122 (1200-3400)

133	GSBON -140	98 (78-121)	143 (112-180)	102 (102-102)	36 (30-40)	2952 (2100-5000)
134	GSBON -141	104 (93-124)	153 (136-185)	112 (103-121)	44 (36-50)	2318 (1333-3340)
135	GSBON -142	107 (92-125)	154 (136-185)	102 (95-109)	33 (26-38)	1925 (1667-2167)
136	GSBON -143	106 (92-124)	150 (136-175)	102 (93-110)	42 (38-44)	1932 (1627-2333)
137	GSBON -144	102 (92-121)	150 (136-175)	99 (90-108)	42 (36-45)	2810 (1833-4373)
138	GSBON -145	101 (82-123)	144 (120-175)	102 (98-106)	44 (38-50)	2278 (1533-2747)
139	GSBON -146	100 (82-123)	144 (120-175)	105 (100-109)	36 (28-44)	2382 (1767-3333)
140	GSBON -148	103 (82-123)	146 (120-180)	95 (88-102)	41 (38-43)	2733 (2267-3467)
141	GSBON -149	99 (80-121)	142 (118-170)	95 (81-109)	37 (33-42)	2378 (1147-4833)
142	GSBON -150	95 (80-111)	145 (118-180)	96 (84-107)	39 (34-46)	2917 (2000-3667)
143	GSBON -151	103 (83-124)	146 (121-180)	104 (102-106)	36 (30-43)	2343 (1180-3400)
144	GSBON -152	98 (83-113)	144 (121-175)	115 (107-122)	39 (34-41)	1493 (453-2333)
145	GSBON -153	100 (83-121)	144 (121-175)	98 (93-102)	37 (32-40)	1689 (1067-2000)
146	GSBON -154	95 (78-113)	141 (112-175)	99 (98-99)	43 (37-50)	2398 (493-4333)
147	GSBON -155	103 (81-125)	143 (120-170)	100 (95-105)	34 (27-37)	2093 (1167-3667)
148	GSBON -156	104 (83-125)	147 (121-180)	106 (90-122)	36 (32-42)	2195 (1167-3133)
149	GSBON -157	103 (76-125)	145 (110-185)	91 (83-99)	35 (29-42)	2150 (900-3667)
150	GSBON -158	100 (76-121)	145 (110-185)	106 (95-116)	38 (32-42)	2115 (727-3167)
151	GSBON -159	98 (76-123)	143 (110-180)	111 (99-122)	36 (34-38)	2288 (1220-3833)
152	GSBON -160	95 (76-113)	141 (110-175)	105 (93-117)	33 (32-33)	2180 (1120-3667)
153	GSBON -161	105 (89-121)	149 (126-180)	83 (50-115)	38 (35-41)	1944 (1833-2000)
154	GSBON -162	101 (87-119)	145 (126-170)	75 (40-109)	29 (14-40)	1130 (333-2500)
155	GSBON -163	104 (89-124)	149 (126-185)	70 (35-104)	43 (38-47)	1910 (33-2833)
156	GSBON -164	104 (82-125)	147 (120-180)	76 (45-106)	33 (30-38)	1423 (67-3133)
157	GSBON -165	97 (82-116)	147 (120-185)	83 (50-116)	34 (30-38)	2200 (333-3433)
158	GSBON -166	100 (80-124)	147 (118-185)	85 (55-114)	38 (32-46)	2538 (667-3767)
159	GSBON -167	100 (80-124)	145 (118-180)	86 (70-102)	35 (34-36)	2507 (1027-4167)
160	GSBON -168	100 (82-124)	147 (120-185)	85 (65-105)	37 (32-39)	1935 (933-2667)
161	GSBON -169	99 (77-124)	140 (110-170)	93 (68-117)	33 (28-38)	1328 (847-1967)
162	GSBON -170	97 (80-111)	144 (118-175)	90 (75-104)	33 (32-34)	2555 (2167-3533)
163	GSBON -171	100 (80-123)	146 (118-180)	102 (80-124)	41 (36-45)	1513 (1167-2067)
164	GSBON -172	95 (78-113)	143 (110-180)	110 (95-124)	40 (34-47)	2183 (1000-3400)
165	GSBON -173	102 (83-124)	148 (121-185)	95 (90-99)	43 (40-45)	2758 (1667-4033)
166	GSBON -174	104 (80-124)	148 (118-185)	99 (92-105)	38 (32-42)	3147 (1867-4000)
167	GSBON -175	103 (80-125)	148 (118-185)	96 (93-99)	33 (25-37)	2875 (1933-3833)
168	GSBON -176	107 (86-125)	147 (124-175)	111 (90-131)	33 (23-40)	1495 (547-2167)
169	GSBON -177	103 (86-121)	146 (124-175)	101 (99-102)	40 (34-43)	1642 (333-2833)
170	GSBON -178	107 (86-125)	150 (124-185)	102 (98-106)	40 (36-43)	2215 (1600-2527)
171	GSBON -180	96 (83-113)	146 (120-180)	101 (92-110)	36 (28-48)	2562 (2000-3380)
	Lakhan (Check)	102 (78-125)	149 (110-185)	102 (80-131)	38 (23-48)	3285 (967-5833)

Elite International Barley Germplasm Nursery (EIBGN 2019-20)

The EIBGN was constituted with 45 germplasm lines selected from ICARDA trials/ nurseries of 2018-19 crop season and six released varieties (BH946, BH959, BHS400, RD2715, DWRB101 and DWRB137) used as checks. These 45 promising germplasm lines were selected from different international trials and nurseries based on their performance in *rabi* 2019-20 under respective trials/ nurseries. A set of 75 entries including six checks repeated five times at each location was supplied to ten locations across NWPZ (Karnal, Hisar, Durgapura, Ludhiana, Pantnagar), NEPZ (Kanpur, Faizabad, Varanasi) and NHZ (Shimla, Bajaura). However, Ludhiana centre did not report the data. Each entry was sown in a plot of two rows of 2.5 m length and spaced at 30 cm, except at Durgapura centre where the plot size used was two rows of 3m x 30 cm. The data for grain yield recorded in grams (g) per plot (1.5 m^2 /1.8 m^2) were converted into q/ha and analysed centre-wise, zone-wise and over all across the zones. Similarly, data for ancillary characters is tabulated trait-wise as mean and range for a character across the 9-testing locations.

In NWPZ, highest zonal mean for grain yield was recorded in the entry 6th GSBON-32 (33.7 q/ha) followed by seven more entries in the first NSG. Among these entries 6^{th} GSBON-27 and 6^{th} GSBON-32 registered superior yields at two locations (Durgapura and Karnal). Similarly, two test entries 6^{th} GSBON-47 and 6^{th} GSBON-82 were superior at Karnal and Pantnagar locations. The only test entry IBON-HI-119 which was superior at Hisar, registered superiority for grain yield at Pantnagar location also. Among the check varieties DWRB137 was found to be the best check (33.71 q/ha) at zonal level and no test entry was found to be statistically superior over this check. DWRB137 was the best check at Hisar, Karnal and Pantnagar locations, except at Durgapura where RD2715 was the best check (19.8 q/ha).

In NEPZ the highest grain yield was recorded in the entry IBON-HI-119 (35.48 q/ha), followed by nine more entries in the first non-significant group. Two test entries IBYT-HI-2018-19-23 and 6^{th} GSBYT-3 were found to be superior in grain yields at all the three locations Kanpur, Faizabad and Varanasi. Four test entries 6^{th} GSBON-86, 6^{th} GSBYT-10, 6^{th} GSBYT-15 and 6^{th} GSBON-95 were superior at two (Kanpur and Varanasi) of the three locations. One test entry IBON-HI-119 was superior at Faizabad and Varanasi locations. Among the checks DWRB137 (32.36 q/ha) was the best check across the locations. This check was also the best check at Kanpur and Faizabad locations, while at Varanasi DWRB101 was the best check.

In North Hill Zone the 6^{th} GSBON-47 (34.1q/ha) ranked first for grain yield followed four more entries (6^{th} GSBON-2018-19-34, 6^{th} GSBON-2018-19-12, IBON-HI-2018-19-83 and IBON-HI-2018-19-72). Among these entries only one test entry 6^{th} GSBON-2018-19-12 was found to have consistent superior performance at both the locations of this zone. BH959 was the best check variety (31.47 q/ha) across the locations and also at each of the two testing locations (Bajaura and Shimla) of this zone.

The highest grain yield across the zones was registered by 6th GSBON-2018-19-34 (32.6 q/ha) followed by IBON-HI-2018-19-119, 6^{th} GSBON-2018-19-32, 6^{th} GSBON-2018-19-86, 6^{th} GSBON-2018-19-47 and 6^{th} GSBON-2018-19-27 in the first NSG. One test entry 6^{th} GSBON-2018-19-34 was found to be superior for grain yield in all the three zones (NWPZ, NEPZ and NHZ). In addition, two test entries 6^{th} GSBON-2018-19-32 and IBON-HI-2018-19-119 recorded superior yields in NWPZ and NEPZ. DWRB137 was the best check across the zones.

Details of the EIBGN entries included for multilocation evaluation (2019-20)

Tr.	Entry Name	Parentage/ Cross details
T1	6th GSBON(2018-19)-4	G09111 F3 10/030605
T2	6th GSBON(2018-19)-8	BF891M-617/4/HMA-02//11012-2/CM67/3/ARAR/5/BLACKTARIDAN
T3	6th GSBON(2018-19)-9	LA MOLINA 94/FOSTER
T4	6th GSBON(2018-19)-12	BISON 218.1/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1
T5	6th GSBON(2018-19)-27	BARONESE/5/ESCOBA/3/MOLA/SHYRI//ARUPO*2/JET/4/ALELI/6/ SEL/7/LIMON/AZAF
T6	6th GSBON(2018-19)-32	PENCO/CHEVRON-BAR/3/LEGACY//PENCO/CHEVRON-BAR
T7	6th GSBON(2018-19)-34	CEV 96060//BUCK M8.88/E.ACACIA/3/CANELA
T8	6th GSBON(2018-19)-35	M104/PFC 88210//DOÑA JOSEFA
T9	6th GSBON(2018-19)-40	PENCO/CHEVRON-BAR/3/LEGACY//PENCO/CHEVRON-BAR
T10	6th GSBON(2018-19)-47	WABAR2242//LIMON/BICHY2000
T11	6th GSBON(2018-19)-77	MSEL/LOGAN-BAR
T12	6th GSBON(2018-19)-82	GHINNERI(SMOOTH_AWNS)/OSIRIS
T13	6th GSBON(2018-19)-86	PENCO/CHEVRON-BAR//FALCON-BAR
T14	6th GSBON(2018-19)-95	GLORIA-BAR/COPAL/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA1
T15	6th GSBON(2018-19)-101	MSEL/LOGAN-BAR
T16	6th GSBON(2018-19)-124	PENCO/CHEVRON-BAR/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA1
T17	6th GSBON(2018-19)-132	CANELA//ATAH92/GOB
T18	6th GSBON(2018-19)-135	CANELA//E.QUEBRACHO/W9338
T19	IBON-HI (2018-19)-7	LIMON/BICHY2000//DEFRA/DESCONOCIDA-BAR
T20	IBON-HI (2018-19)-12	NISKA/H00057
T21	IBON-HI (2018-19)-16	H93125/SEEBE
T22	IBON-HI (2018-19)-32	H92013289Z\H93003203Z
T23	IBON-HI (2018-19)-34	ZIGZIG/3/LBIRAN/UNA80//LIGNEE640
T24	IBON-HI (2018-19)-45	CANELA//LIMON/BICHY2000
T25	IBON-HI (2018-19)-50	GLORIA-BAR/COPAL//CIRU
T26	IBON-HI (2018-19)-61	CANELA//LIMON/BICHY2000
T27	IBON-HI (2018-19)-71	BCD12/CANELA
T28	IBON-HI (2018-19)-72	AJO 61/6/VMORALES
T29	IBON-HI (2018-19)-73	CANELA//LIMON/BICHY2000
T30	IBON-HI (2018-19)-75	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1
T31	IBON-HI (2018-19)-83	CANELA/CONLON
T32	IBON-HI (2018-19)-89	CANELA//LIMON/BICHY2000
T33	IBON-HI (2018-19)-119	CANELA//LIMON/BICHY2000
T34	IBON-HI (2018-19)-121	G09107 F3 10/030601
T35	IBON-HI (2018-19)-122	BREA/DL70//3*CABUYA/3/PENCO/CHEVRON-BAR
T36	IBYT-HI (2018-19)-6	CIRU/ZIGZIG
T37	IBYT-HI (2018-19)-12	J09049 F3 10/030552
T38	IBYT-HI (2018-19)-14	SVANHALS-BAR/MSEL//AZAF/GOB24DH/3/NE167/CLE176
T39	IBYT-HI (2018-19)-18	CIRU//BREA/DL70/3/SUMBARD400
T40	IBYT-HI (2018-19)-23	VMORALES
T41	6th GSBYT (2018-19)-3	P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA1/6/CHAMICO /TOCTE//CONGONA
T42	6th GSBYT (2018-19)-6	BREA/DL70//CABUYA/6/P.STO/3/LBIRAN/UNA80//LIGNEE640/4/BLLU/5/PETUNIA 1
T43	6th GSBYT (2018-19)-10	CANELA//LIMON/BICHY2000
T44	6th GSBYT (2018-19)-13	LIMON/BICHY2000//DEFRA/DESCONOCIDA-BAR
T45	6th GSBYT (2018-19)-15	AVT/ATTIKI//M-ATT-73-337-1/3/ATHS/LIGNEE686/4/KABAA
C1	BH 946	CHECK
C2	BH 959	CHECK
C3	BHS 400	CHECK
C4	RD 2715	CHECK
C5	DWRB 101	CHECK
C6	DWRB137	CHECK

Zonal means for grain yield, of barley genotypes in EIBGN at different locations in *rabi* 2019-2020.

Entry	NWPZ (5)			NEPZ (3)			NHZ (2)			National (10)		
6th GSBON (2018-19)-4	27.3	21	0	21.0	40	0	21.8	22	0	24.0	29	0
6th GSBON (2018-19)-8	22.4	34	0	17.2	44	0	18.9	36	0	19.9	42	0
6th GSBON (2018-19)-9	25.3	29	0	17.3	43	0	23.6	16	0	22.2	36	0
6th GSBON (2018-19)-12	27.9	16	0	24.9	25	0	33.4	3	1	28.1	12	0
6th GSBON (2018-19)-27	33.9	3	1	28.3	19	0	27.1	6	0	30.5	6	1
6th GSBON (2018-19)-32	34.8	1	1	29.8	10	1	26.1	8	0	31.2	3	1
6th GSBON (2018-19)-34	32.5	5	1	31.8	6	1	33.8	2	1	32.6	1	1
6th GSBON (2018-19)-35	26.6	25	0	28.9	15	0	21.1	25	0	26.1	22	0
6th GSBON (2018-19)-40	26.9	23	0	28.1	20	0	26.4	7	0	27.2	15	0
6th GSBON (2018-19)-47	32.4	6	1	25.8	22	0	34.1	1	1	30.6	5	1
6th GSBON (2018-19)-77	29.0	12	0	29.0	14	0	23.0	18	0	27.7	13	0
6th GSBON (2018-19)-82	33.6	4	1	29.5	11	0	22.0	21	0	29.7	8	0
6th GSBON (2018-19)-86	32.0	8	1	33.6	4	1	25.4	11	0	31.1	4	1
6th GSBON (2018-19)-95	24.6	31	0	29.9	9	1	23.0	17	0	26.0	23	0
6th GSBON (2018-19)-101	15.2	45	0	23.2	32	0	19.7	29	0	18.8	44	0
6th GSBON (2018-19)-124	19.7	43	0	25.5	23	0	17.4	42	0	21.1	37	0
6th GSBON (2018-19)-132	17.5	44	0	24.5	28	0	18.4	39	0	20.0	41	0
6th GSBON (2018-19)-135	21.2	40	0	18.1	42	0	17.7	41	0	19.4	43	0
IBON-HI(2018-19)-7	28.3	13	0	28.9	16	0	21.4	24	0	27.0	17	0
IBON-HI(2018-19)-12	27.4	19	0	21.9	35	0	18.7	38	0	23.7	30	0
IBON-HI(2018-19)-16	27.7	17	0	24.6	27	0	19.6	30	0	24.9	25	0
IBON-HI(2018-19)-32	27.3	20	0	21.6	36	0	19.2	33	0	23.6	31	0
IBON-HI(2018-19)-34	26.7	24	0	24.8	26	0	19.2	34	0	24.4	27	0
IBON-HI(2018-19)-45	20.1	42	0	21.5	37	0	18.9	37	0	20.3	40	0
IBON-HI(2018-19)-50	22.0	37	0	23.2	31	0	21.6	23	0	22.3	35	0
IBON-HI(2018-19)-61	25.5	28	0	28.6	17	0	25.4	10	0	26.5	19	0
IBON-HI(2018-19)-71	28.2	14	0	25.2	24	0	23.9	14	0	26.3	20	0
IBON-HI(2018-19)-72	27.0	22	0	24.0	29	0	29.9	5	1	26.7	18	0
IBON-HI(2018-19)-73	26.5	26	0	21.4	38	0	19.3	32	0	23.2	32	0
IBON-HI(2018-19)-75	25.1	30	0	21.3	39	0	20.4	28	0	22.8	33	0
IBON-HI(2018-19)-83	22.1	35	0	21.0	41	0	32.3	4	1	24.0	28	0
IBON-HI(2018-19)-89	20.3	41	0	16.1	45	0	16.8	43	0	18.1	45	0
IBON-HI(2018-19)-119	34.3	2	1	35.5	1	1	24.0	13	0	32.4	2	1
IBON-HI(2018-19)-121	22.0	38	0	29.0	13	0	23.8	15	0	24.7	26	0
IBON-HI(2018-19)-122	24.6	32	0	23.0	33	0	18.0	40	0	22.6	34	0
IBYT-HI(2018-19)-6	21.8	39	0	22.3	34	0	15.4	44	0	20.6	39	0
IBYT-HI(2018-19)-12	22.1	36	0	23.5	30	0	14.6	45	0	20.9	38	0
IBYT-HI(2018-19)-14	26.3	27	0	30.1	7	1	24.0	12	0	27.0	16	0
IBYT-HI(2018-19)-18	27.9	15	0	28.5	18	0	19.5	31	0	26.2	21	0
IBYT-HI(2018-19)-23	27.5	18	0	35.0	2	1	20.9	27	0	28.5	10	0
6th GSBYT(2018-19)-3	29.8	10	0	34.9	3	1	22.7	20	0	29.9	7	0
6th GSBYT(2018-19)-6	32.1	7	1	29.3	12	0	19.0	35	0	28.3	11	0
6th GSBYT(2018-19)-10	30.1	9	0	32.5	5	1	23.0	19	0	29.3	9	0

6th GSBYT(2018-19)-13	23.2	33	0	27.4	21	0	26.0	9	0	25.2	24	0
6th GSBYT(2018-19)-15	29.1	11	0	30.0	8	1	21.0	26	0	27.6	14	0
CD	3.71			5.78			5.75			2.41		
Checks												
BH946	26.0			21.6			23.6			24.0		
BH959	32.3			31.6			**31.5**			31.9		
BHS400	32.9			30.6			29.4			31.4		
RD2715	28.6			23.6			19.9			25.0		
DWRB101	28.2			29.8			25.8			28.2		
DWRB137	**33.7**			**32.4**			29.0			**32.2**		

Range and Mean across the locations for ancillary traits of EIBGN entries

SN	Entry	Row Type	DHA	DMA	PH (cm)	Tillers/ meter	Spike Length (cm)	Grains /spike	1000-gw (g)
1	6th GSBON -4	6R	96 (81-127)	139 (114-184)	90 (68-106)	96 (58-123)	9 (7-15)	62 (8-90)	36 (29-44)
2	6th GSBON -8	2R	98 (81-127)	142 (118-188)	86 (60-106)	96 (41-124)	7 (5-10)	27 (6-38)	44 (34-54)
3	6th GSBON -9	6R	99 (74-126)	140 (117-186)	87 (62-103)	77 (11-150)	8 (6-10)	61 (9-90)	36 (32-42)
4	6th GSBON -12	2R	92 (74-122)	135 (110-174)	88 (66-105)	90 (60-132)	8 (7-9)	49 (9-84)	39 (36-43)
5	6th GSBON -27	6R	92 (73-124)	137 (106-180)	93 (71-109)	111 (73-140)	8 (7-9)	26 (8-32)	52 (38-60)
6	6th GSBON -32	2R	92 (73-123)	137 (107-180)	93 (69-112)	122 (77-160)	7 (4-9)	24 (9-32)	51 (34-58)
7	6th GSBON -34	6R	97 (80-125)	142 (121-182)	97 (84-113)	95 (55-118)	7 (6-9)	49 (5-72)	45 (35-56)
8	6th GSBON -35	6R	93 (69-125)	140 (108-182)	98 (80-109)	91 (51-149)	8 (5-9)	58 (10-84)	43 (38-49)
9	6th GSBON -40	6R	96 (74-124)	139 (110-180)	101 (88-110)	98 (66-139)	8 (6-10)	57 (8-90)	40 (34-43)
10	6th GSBON -47	6R	96 (80-122)	140 (114-180)	92 (80-110)	110 (87-146)	7 (5-8)	53 (8-72)	38 (25-45)
11	6th GSBON -77	6R	95 (74-125)	139 (111-184)	94 (76-117)	86 (43-115)	7 (5-10)	47 (8-72)	48 (34-54)
12	6th GSBON -82	6R	95 (74-123)	137 (110-182)	90 (68-110)	84 (56-122)	7 (3-9)	53 (7-78)	37 (24-43)
13	6th GSBON -86	6R	95 (73-126)	140 (109-184)	88 (73-106)	90 (51-132)	8 (7-10)	63 (8-90)	42 (36-49)
14	6th GSBON -95	2R	102 (83-127)	119 (19-186)	104 (83-128)	109 (90-153)	9 (6-11)	26 (10-32)	45 (32-54)
15	6th GSBON -101	2R	102 (87-128)	143 (122-186)	91 (75-118)	114 (80-168)	7 (6-8)	22 (5-28)	39 (25-49)
16	6th GSBON -124	2R	97 (79-125)	137 (119-180)	98 (73-125)	93 (70-130)	8 (7-10)	30 (9-74)	45 (32-59)
17	6th GSBON -132	6R	97 (74-127)	140 (114-186)	94 (71-119)	87 (54-150)	8 (5-10)	47 (10-66)	40 (28-48)
18	6th GSBON -135	6R	101 (83-121)	145 (124-176)	98 (63-128)	90 (65-146)	8 (7-11)	54 (11-74)	39 (33-46)
19	IBON-HI -7	2R	94 (71-126)	139 (110-186)	94 (65-125)	106 (85-152)	8 (7-9)	25 (9-30)	51 (38-61)
20	IBON-HI -12	2R	97 (74-126)	140 (118-186)	101 (85-120)	90 (56-123)	9 (6-11)	27 (10-34)	49 (36-57)
21	IBON-HI -16	2R	94 (72-125)	139 (112-184)	95 (78-111)	92 (54-135)	8 (5-10)	24 (9-30)	50 (32-60)
22	IBON-HI -32	2R	93 (73-127)	138 (106-184)	91 (72-107)	93 (54-136)	8 (5-11)	23 (8-28)	53 (34-67)
23	IBON-HI -34	2R	91 (71-122)	137 (107-176)	107 (91-123)	91 (43-151)	8 (5-10)	26 (9-33)	51 (36-59)
24	IBON-HI -45	2R	91 (68-124)	135 (106-174)	94 (79-112)	98 (55-161)	7 (4-9)	23 (8-32)	40 (31-48)
25	IBON-HI -50	6R	97 (71-126)	142 (117-186)	95 (72-111)	103 (70-147)	7 (5-8)	51 (9-66)	45 (38-50)
26	IBON-HI -61	6R	94 (70-126)	138 (109-186)	91 (70-116)	89 (60-112)	8 (4-10)	67 (9-90)	38 (32-41)
27	IBON-HI -71	2R	95 (75-128)	139 (111-184)	94 (73-109)	102 (68-130)	7 (4-9)	25 (6-32)	47 (34-58)
28	IBON-HI -72	2R	95 (76-125)	139 (114-184)	95 (74-114)	116 (84-201)	9 (4-13)	31 (7-38)	41 (32-47)
29	IBON-HI -73	2R	95 (74-126)	137 (109-186)	94 (74-111)	103 (70-178)	8 (5-11)	28 (9-36)	47 (36-55)
30	IBON-HI -75	2R	94 (72-125)	137 (110-181)	100 (88-115)	104 (69-181)	9 (4-10)	26 (8-33)	52 (32-58)

31	IBON-HI -83	2R	102 (81-133)	145 (121-183)	97 (83-112)	121 (65-190)	8 (5-10)	29 (10-37)	43 (25-53)
32	IBON-HI -89	6R	102 (74-133)	144 (122-190)	87 (62-110)	80 (53-112)	8 (6-10)	57 (8-74)	40 (36-45)
33	IBON-HI -119	6R	98 (73-130)	141 (114-188)	95 (78-106)	102 (62-160)	8 (6-13)	64 (8-96)	47 (35-55)
34	IBON-HI -121	6R	93 (70-122)	136 (110-182)	88 (70-97)	100 (56-138)	7 (5-9)	52 (5-83)	39 (34-45)
35	IBON-HI -122	6R	104 (91-131)	146 (119-190)	96 (74-108)	95 (42-125)	6 (4-9)	46 (7-66)	42 (28-53)
36	IBYT-HI -6	6R	98 (81-130)	142 (120-188)	91 (72-103)	96 (54-134)	8 (4-10)	61 (8-78)	42 (29-56)
37	IBYT-HI -12	2R	102 (89-131)	143 (114-190)	102 (86-120)	98 (58-141)	10(7-12)	29 (9-36)	43 (29-52)
38	IBYT-HI -14	2R	95 (76-121)	140 (114-180)	99 (86-110)	110 (53-181)	10(6-12)	28 (10-34)	45 (40-51)
39	IBYT-HI -18	6R	95 (71-123)	138 (116-180)	92 (77-107)	104 (54-157)	7 (6-10)	52 (9-66)	35 (26-39)
40	IBYT-HI -23	6R	94 (70-124)	138 (109-178)	91 (76-106)	94 (35-150)	7 (5-8)	58 (9-75)	39 (31-45)
41	6th GSBYT -3	6R	94 (71-123)	137 (109-181)	92 (66-109)	81 (27-139)	9 (7-11)	66 (7-90)	42 (36-60)
42	6th GSBYT -6	6R	97 (72-126)	139 (113-184)	178 (69-858)	92 (52-153)	8 (6-10)	55 (7-78)	36 (29-42)
43	6th GSBYT -10	2R	94 (78-127)	137 (109-176)	99 (90-113)	118 (58-161)	7 (4-8)	30 (6-66)	46 (38-59)
44	6th GSBYT -13	2R	105 (81-138)	145 (119-190)	81 (69-100)	109 (59-154)	8 (6-10)	23 (8-31)	47 (32-56)
45	6th GSBYT -15	6R	96 (71-121)	139 (117-178)	94 (80-106)	99 (73-150)	8 (6-11)	54 (11-78)	42 (29-57)
	BH946 (C)	6R	93 (71-122)	137 (108-182)	99 (72-121)	84 (27-117)	8 (6-11)	65 (5-90)	38 (26-49)
	BH959 (C)	6R	91 (69-129)	137 (107-181)	83 (61-110)	104 (51-153)	8 (6-11)	54 (6-78)	39 (28-48)
	BHS400 (C)	6R	101 (74-131)	144 (117-190)	99 (83-122)	103 (51-174)	8 (7-10)	54 (5-78)	40 (26-52)
	DWRB101 (C)	2R	92 (72-124)	138 (110-178)	89 (65-113)	108 (56-170)	8 (5-10)	27 (5-44)	47 (34-56)
	DWRB137 (C)	6R	95 (69-131)	139 (107-190)	93 (61-122)	100 (27-174)	8 (5-11)	51 (5-90)	41 (26-57)
	RD2715 (C)	6R	90 (72-116)	136 (106-176)	98 (74-121)	80 (51-111)	8 (5-12)	60 (6-92)	44 (28-55)

National Barley Genetic Stock Nursery (NBGSN-2019-20)

The National Barley Genetic Stock Nursery comprising of a set of 15 promising entries endowed with trait(s) of breeding value, contributed by different coordinated centres was supplied for evaluation at 10-centres (Durgapura, Ludhiana, Karnal, Hisar, Faizabad, Varanasi, Pantnagar, Kanpur, Shimla and Bajaura). These genotypes are a kind of suggested crossing block with recently identified sources of unique traits. Though the precise utilization reports for these genotypes by individual centers/ breeders during the crop season have not been received, while some centers indicted the utilization in hybridization. Bajaura centre has utilised NBGSN entries HBL 814, HBL 812, BBM 797, BBM 814 and VB 1826 in the crossing programme, while Shimla centre will use after one year of local evaluation. Similarly, Durgapura centre has used 10 genotypes in the crossing program. The data recorded at different centers is presented below, while Ludhiana centre did not report data. Genotype wise means and ranges obtained for different ancillary traits, and grain yield (g/plot) in a plot of 1.5 m^2 across the locations are given in the following table.

List of NBGSN entries

Genotype	Cross details	Special traits/ features
DWRB160	DWRB62/DWRB73	Bold Grains (%) and 1000-gw
PL907	PL829/DWR81	Bold Grains (%) and 1000-gw
BH1025	NBGSN13/BH393	Bold Grains (%) and 1000-gw
RD3008	Clipper/RD2668//DWR 73	Over all malt quality, Resistance to Leaf Blight
DWRB182	DWRUB52 /DWRB78	Grain and wort Beta Glucan, Over all malt quality
KB1743	INBON-76(2011-12)/RD2826	Grain and wort Beta Glucan
RD3009	DWR16 x RD2503//RD2668	Leaf blight resistance
HBL812	DWRUB74/ HBL316	Yellow and brown rust resistance
HBL814	RD2752/ Dolma	Yellow and black rust resistance
BBM797	BHS385/ BHS369	Yellow rust resistance
BBM800	BHS385 / BHS369	Yellow rust resistance
BBM814	4th INBON (2015)-59	Yellow rust resistance
BBM816	BBM 556/ HBL 113	Yellow rust resistance
BBM820	BHS369/HBL704	Yellow rust resistance
VB1826	CANELA/5/PENCO/CHEVRON-BAR	Yellow rust resistance

Range and mean for ancillary characters and grain yield of NBGSN entries in *rabi* 2019-20

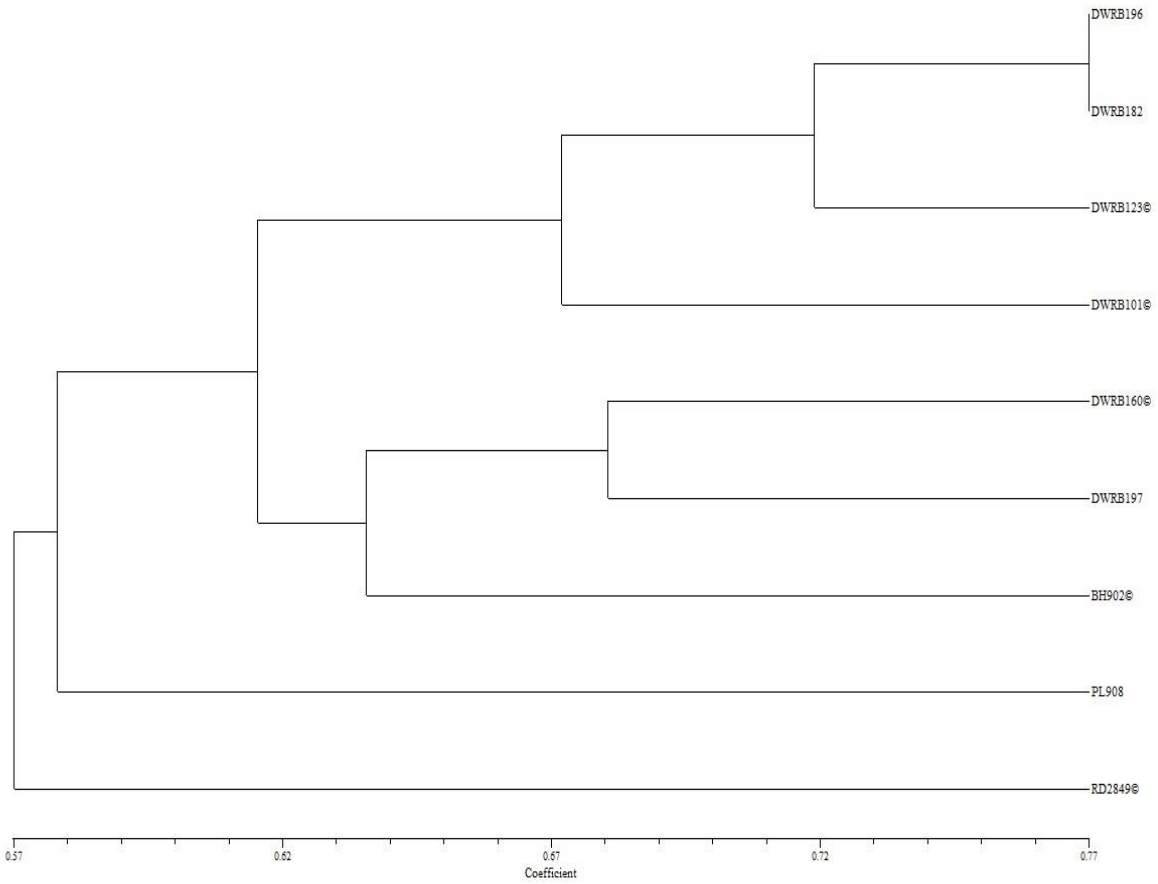
Genotype	2/6 Row	DHA	DMA	PH (cm)	Tillers /m	S Length (cm)	Grain/ Spike	1000-GW (g)	GY per plot (g)
DWRB160	2	81-128 (98)	112-185 (142)	60-98 (80)	62-152 (105)	6-11 (8)	16-32 (27)	46-78 (61)	136-824 (465)
PL907	2	73-127 (92)	106-174 (137)	72-99 (81)	62-122 (91)	5-13 (9)	12-28 (23)	44-60 (54)	200-650 (426)
BH1025	2	85-133 (101)	122-187 (143)	74-110 (83)	59-146 (109)	6-9 (8)	9-32 (23)	42-63 (53)	180-650 (482)
RD3008	2	72-127 (94)	106-174 (138)	71-115 (89)	72-155 (110)	6-9 (7)	8-31 (22)	38-52 (44)	178-725 (439)
DWRB182	2	81-126 (97)	112-178 (140)	62-95 (74)	82-140 (114)	6-9 (7)	5-26 (20)	37-50 (44)	162-575 (373)
KB1743	6	71-111 (88)	105-172 (136)	76-101 (87)	65-146 (101)	6-10 (8)	7-67 (49)	40-56 (45)	190-700 (452)
RD3009	2	72-111 (88)	106-174 (140)	71-99 (83)	59-138 (95)	7-9(8)	6-28 (22)	45-63 (55)	113-725 (408)
HBL812	6	81-126 (97)	110-180 (142)	62-115 (82)	38-128 (85)	6-13 (9)	9-96 (68)	16-45 (32)	34-550 (323)
HBL814	6	83-134 (101)	110-178 (139)	72-107 (85)	42-128 (81)	6-10 (8)	11-94 (62)	14-53 (35)	23-500 (323)
BBM797	6	86-135 (100)	115-180 (142)	73-111 (91)	45-135 (80)	6-12 (8)	10-96 (58)	21-46 (40)	38-725 (433)
BBM800	2	91-140 (107)	122-186 (146)	68-110 (89)	60-150 (94)	7-11 (9)	10-30 (25)	28-58 (41)	65-460 (292)
BBM814	6	81-136 (98)	110-179 (141)	72-128 (88)	60-134 (106)	5-8 (6)	12-72 (47)	37-56 (44)	159-750 (502)
BBM816	2	85-136 (100)	122-186 (145)	72-119 (91)	47-131 (103)	6-13 (10)	10-33 (25)	41-57 (48)	125-650 (384)
BBM820	6	83-145 (106)	114-186 (146)	77-116 (94)	42-135 (96)	6-10 (8)	9-78 (46)	21-49 (35)	99-900 (345
VB1826	6	86-135 (101)	123-185 (144)	60-112 (94)	43-130 (93)	6-13 (10)	10-90 (63)	20-38 (33)	23-730 (395)

Molecular Report – Barley AVT Trials (2019-20)

AVT entries were characterized at molecular level to analyze genetic variability in Advanced Varietal Trial-Malt Barley 2019-20. A set of nine genotypes including four test entries (DWRB182, DWRB196, DWRB197 and PL908) and checks (DWRB101, DWRB123, DWRB160, RD2849 & BH902) were screened using barley specific molecular markers. Total 46 SSR/STS markers covering seven chromosomes of barley were screened to develop molecular profiles. Molecular weights for microsatellite products, in base pairs, were estimated and the summary statistics including the number of alleles per locus and polymorphism information content (PIC) were determined. Total 78 alleles were scored for PCR based amplification profiles for nine genotypes. The number of alleles ranged from 1 to 3 with an average of 1.69 alleles per locus. The band fragment size varied from 90 bp to 1500 bp with PIC values ranging from 0.0 to 0.75.

Allele molecular weight data of amplified profiles were converted to develop binary format (allele presence = "1" and allele absence = "0") for genetic diversity analysis with NTSYS-PC version 2.1. The similarity matrix developed was used to construct dendrograms using Sequential Agglomerative Hierarchical Nesting (SAHN) based Unweighted Pair Group Method of Arithmetic Means (UPGMA) to infer genetic relationships. For estimating the similarity matrix, null alleles were treated as missing data to reduce the biased genetic or similarity measures. The dendrogram were developed for each of two test entry and their respective check lines. These genotypes grouped within similarity coefficient (GS) value around 0.57 to 0.77 and showed sufficient genetic variability at molecular level. In both dendrogram, final year entries are placed at separate node thus distinguishing from their check lines, respectively.

The eventual intend of this effort is to develop molecular markers-based amplification profiles for varietal characterization and to assess the level of genetic diversity in Indian barley.



UPGMA based clustering of AVT (2019-20) entries and checks based on SSR/STS molecular profiles

Molecular Profiles of Barley AVT Trials (2019-20)

SN	Marker	Chr	DWRB182	PL908	DWRB196	DWRB197	DWRB101(c)	DWRB123(c)	DWRB160(C)	RD2849(c)	BH902(c)
1.	**Bmac154**	1H	130	130	130	130	130	130	130	130	130
2.	**Bmac213**	1H	155	180	155	180	180	155	180	180	155
3.	**Bmag382**	1H	109	109	109	109	109	109	109	109	109
4.	**Bmag579**	1H	126	110	110	110	126	126	126	110	126
5.	**MGB402**	1H	260	240	260	240	260	260	260	260	260
6.	**ScSSR10477**	1H	150	140	150	150	150	200	140	150	140
7.	**HvHVA1**	1H	136	136	136	136	136	136	136	136	136
8.	**Bmac175**	2H	180	180	155	180	180	155	180	180	155
9.	**EBmac640**	2H	176	176	176	190	176	190	190	190	190
10.	**Bmag15**	2H	181	181	181	181	181	181	181	181	181
11.	**EBmac525**	2H	149	149	149	149	149	149	125	149	149
12.	**EBmac623**	2H	154	154	154	168	168	154	168	154	168
13.	**cMWG658**	2H	580	580	580	580	580	580	580	580	600
14.	**Ebmatc39**	2H	170	170	170	150	170	170	170	150	150
15.	**Bmag006**	3H	274	274	274	274	274	274	274	274	274
16.	**Bmag603**	3H	140	140	140	122	122	122	122	122	140
17.	**Bmag877**	3H	165	165	165	165	165	165	165	165	165
18.	**Ebmac541**	3H	106	120	106	106	106	106	106	106	106
19.	**MWG 847**	3H	345	345	345	345	345	345	345	345	345
20.	**Bmag225**	3H	165	165	165	165	185	185	185	185	165
21.	**HvLTPPB**	3H	200	216	200	200	216	200	200	216	200
22.	**Bmag841**	3H	125	125	125	125	125	125	125	115	125
23.	**ABG500**	4H	189	189	189	189	189	189	189	189	189

24.	**HVM40**	4H	150	160	150	150	150	160	150	160	150
25.	**HVM67**	4H	126	126	136	126	136	136	136	136	126
26.	**HvMLOH1A**	4H	175	185	175	175	185	175	185	185	175
27.	**Ksug10**	4H	1300	1500	1300	1500	1500	1500	1500	1300	1300
28.	**MWG634**	4H	800	800	800	800	800	800	800	800	800
29.	**WG622**	4H	161	161	161	161	161	161	161	161	161
30.	**Bmag353**	4H	90	90	119	119	90	90	119	90	90
31.	**Bmag337**	5H	165	145	165	165	165	145	145	145	145
32.	**Bmag751**	5H	189	189	189	189	189	189	189	189	189
33.	**Bmag812**	5H	157	157	157	157	157	157	167	167	167
34.	**GMS61**	5H	135	135	135	145	145	135	145	145	145
35.	**Bmac303**	5H	119	119	119	119	119	119	138	138	138
36.	**ABG458**	6H	248	248	248	248	248	248	248	248	248
37.	**Bmac40**	6H	210	236	210	210	210	210	236	236	210
38.	**Bmac500**	6H	110	110	190	110	110	110	110	190	110
39.	**GBM1215**	6H	200	240	240	240	200	200	240	200	240
40.	**HVM11**	6H	175	175	175	175	175	175	175	175	175
41.	**MWG2029**	6H	245	245	245	245	245	245	245	245	245
42.	**ABC15864**	7H	167	167	167	167	167	167	167	167	167
43.	**Bmac64**	7H	140	140	155	155	140	140	155	155	155
44.	**Bmac162**	7H	187	200	200	187	200	200	187	200	200
45.	**Bmac167**	7H	184	195	195	195	195	195	184	195	195
46.	**Bmag110**	7H	135	135	135	135	145	135	135	145	145

Molecular weight of amplified fragments measured in base pairs and calibrated with 100 & 500 bp Ladder

Molecular Markers Used for generating molecular profiles of Barley AVT Entries (2019-20)

SN	Marker	Chr	Sequence of PCR Primer (5'-3')	Amplification Conditions
1.	Bmac154	1H	CTGGGTGATGAATAGAGTTTC TATTCTTCAAAAGATGTTCTGC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @72C
2.	Bmac213	1H	ATGGATGCAAGACCAAAC CTATGAGAGGTAGAGCAGCC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @72C
3.	Bmag382	1H	TGAAACCCATAGAGAGTGAGA TCAAAAGTTTCGTTCCAAATA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @72C
4.	Bmag579	1H	CCTAGATAAGGAACATAGCCA CAAAGACCCTAACTCATGTTC	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 1 cycle of 5 mins @ 72C
5.	MGB402	1H	CAAGCAAGCAAGCAGAGAGA AACTTGTGGCTCTGCGACTC	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
6.	ScSSR10477	1H	CATGGGAGGGGACAACAC CGACCAAACACGACTAAAGGA	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 1 cycle of 5 mins @ 72C
7.	HvHVA1	1H	CATGGGAGGGGACAACAC CGACCAAACACGACTAAAGGA	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 1 cycle of 5 mins @ 72C
8.	Bmac175	2H	CTACACCCCTACCATATAAACA CCTCCCCACATACCTTGT	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
9.	EBMAC640	2H	CTCAGTGCGTTACCAGTGC CCTGTCATGCATAACCTATGG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
10.	Bmag15	2H	TTGAGGGCTGAACACTTCG GCCCACTGTCAAGGACAATT	Touchdown' PCR: 18 cycles of denaturing 1 min @94C and extension 1 min @72C, with annealing for 30s with temp decreased 1C every second cycel from 69C to 60C. Continue 20 cycles for 1 min @94C, 1 min @55C, 1 min @72C. End with 5 min @72C.
11.	EBMAC525	2H	TGACAGTGTCTCCAGTAATGA GTTTGTTCTTTTGATTTTGTTG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
12.	EBmac623	2H	CGAACATTGTCGTGTTAGTAA CTGTCATGCATAACCTATGG'	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
13.	cMWG658	2H	CCAAGAAGGCGAAGAAGGTCC CTCACTGCCCAGAGAAACAGC	STS annealing temperature 62-65oC
14.	Ebmatc39	2H	TAGTCTCTTCATTTATACCATCACC CATGCTGATCCCCCTTCT	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
15.	Bmag6	3H	TTAAACCCCCCCCCTCTAG TGCAGTTACTATCGCTGATTTAGC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
16.	Bmag603	3H	ATACCATGATACATCACATCG GGGGGTATGTACGACTAACTA	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
17.	Bmag877	3H	AAAGCTCATGGTAGATCAAGA TAGTTTTCCCAAAAGCTTCTA	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C

18.	Ebmac541	3H	ACGGATCTACTTTAGCTAGCA AAACAACCCCACACAATC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
19.	MWG847	3H	GTCTTGGCCAGCTACTCCCG CGCACCTGCACCAGAGGTC	STS annealing temperature 65-67C
20.	Bmag225	3H	AACACACCAAAAATATTACATCA CGAGTAGTTCCCATGTGAC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
21.	HvLTPPB	3H	TGCTGAGACGCTGAGTACGTTG CAAACTCACGATTCCTCTCAAAG	35 cycles of 1 min at 94 deg C; 1 min at 50 deg C; 2 min at 72 deg C; and a final extension step of 5 min at 72 deg C
22.	Bmag841	3H	GGAAAGTACTTCAAACCTGAA CTTACAAGATGATGAGAACGA	3 min 94C, 45 cycles of 1 min @94C, 1 min @55C, 2 min @72C, final extension of 10 min @72C. 25 microlitre reactions contained 125 nM of each primer.
23.	ABG500	4H	ATTAATCCGACCGTCACTGC ACGAACTCCTCGCTGCC	STS annealing temperature 58-60C
24.	HVM40	4H	CGATTCCCCTTTTCCCAC ATTCTCCGCCGTCCACTC	Annealing (30 s) temperatures were progressively decreased by 1oC every second cycle from 64C to 55C
25.	HVM67	4H	GTCGGGCTCCATTGCTCT CCGGTACCCAGTGACGAC	'Touchdown' PCR of 48 cycles of 94C for 1 min denaturing and 72C for 1 min extension. Annealing (30 s) temperatures were progressively decreased by 1C every second cycle from 64C to 55C. Annealing conditions of 1 min at 55C were maintained during the final 30 cycles. The reaction ended with a 5-min extension at 72C
26.	HvMLOH1A	4H	CCTCCCCTCTGATATGATAA GTACAGACGGTTTAATTGTCC	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 1 cycle of 5 mins @ 72C
27.	Ksug10	4H	GTCCAGCTTCAGCGAGTAC GTGTTGATGTCCTTGAGGCC	STS annealing temperature 60C
28.	MWG634	4H	GTGCTGGGTGGATTAAAAAAGAGGG GAACTAAAGATAGGCGGGAGTACTG	STS annealing temperature 60C
29.	WG622	4H	CTGCCTGTTGATTTTCCATG TTCACCTTGCCATGACGA	STS annealing temperature 60C
30.	Bmag353	4H	ACTAGTACCCACTATGCACGA ACGTTCATTAAAATCACAACTG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
31.	Bmag337	5H	ACAAAGAGGGAGTAGTACGC GACCCATGATATATGAAGATCA	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
32.	Bmag751	5H	CACTGCAAATATTAAAATGGA GATCTACTGGTCCATAGTTGC	3 min 94C, 45 cycles of 1 min @94C, 1 min @55C, 2 min @72C, final extension of 10 min @72C.
33.	Bmag812	5H	ATAGTTCTTTCAGGACCAATG GTCATATGGATCTCCAAAGAG	3 min 94C, 45 cycles of 1 min @94C, 1 min @55C, 2 min @72C, final extension of 10 min @72C.
34.	GMS61	5H	CACCTGTTCCGTCCCGTC AACCTCTTTTTTATCCCTCGC	STS annealing temperature 60C
35.	Bmac303	5H	CCTCCAAGATTAGATCTCTCTC CCGTATATTTAAGAAATGGTGA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C

36.	ABG458	6H	CCGGTCGGTGCAGAAGAG AAATGAAAGCTAAATGGGCGATAT	STS annealing temperature 55-58 C
37.	Bmac40	6H	AGCCCGATCAGATTTACG TTCTCCCTTTGGTCCTTG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
38.	Bmag500	6H	GGGAACTTGCTAATGAAGAG AATGTAAGGGAGTGTCCATAG	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
39.	GBM1215	6H	ATGACCAGAAAACGCCTGTC GGATTCTGCACACACGAGAA	3 min at 94 deg C; 45 cycles with 30 sec at 94 deg C, 30 sec at 60 deg C (touchdown of 0.5 deg C / cycle for initial 10 cycles - final annealing of 55 deg C for remaining 35 cycles), 30 sec at 72 deg C; and a final extension step of 5 min at 72 deg C
40.	HVM11	6H	CCGGTCGGTGCAGAAGAG AAATGAAAGCTAAATGGGCGATAT	1 cycle of 3 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 55C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C
41.	MWG2029	6H	CCAGTTATCCGAATCCGGAA GTGGTCAGGTACATACGAAT	STS annealing temperature 60C
42.	ABC15864	7H	GCATAAACGGGTGTAAGAGC CATCCAGTTCAGAGGATAGAGC	STS annealing temperature 60C
43.	Bmac64	7H	CTGCAGGTTTCAGGAAGG AGATGCCCGCAAAGAGTT	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
44.	Bmac162		CATGTGTTGAAATCAGTTTTG CCCTCTCTCTCTCTCTCTCTC	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.
45.	Bmac167	7H	CATTTCCACTTCAAAATATCC CCAAAGTTTGAGTGCAGAC	1 cycle of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 30 cycles of 1 min @ 94C, 1 min @ 55C, 1 min @ 72C, 1 cycle of 5 mins @ 72C
46.	Bmag110	7H	ACGAGGAGGGACTAGTACAC CCAACTATATTAACAAGGCTCA	1 cycle of 3 min @ 94C, 1 min @ 58C, 1 min @ 72C, 30 cycles of 30 secs @ 94C, 30 secs @ 58C, 30 secs @ 72C, 1 cycle of 5 mins @ 72C.

Protocol for developing Molecular profiles of Barley AVT Trials 2019-20

Development of Molecular profiles: An equal number of fresh, young leaves (ten days old) of five plants from each of AVT were bulked for DNA extraction. Total genomic DNA was isolated using the modified CTAB method (Saghai-Maroof *et al*, 1984). A set of 46 SSR/STS molecular markers covering whole genome of barley was used to develop amplification profiles of genotypes. PCR reaction was conducted in reaction volume of 10 ul containing 1X PCR buffer. 200 m M dNTPs, 0.25 uM of primer, 2Mm mgcl2, 1 unit Taq polymerase and 50 ng template DNA . PCR amplification was performed using BIORAD S 1000 thermocycler. PCR products were resolved by electrophoresis on 2 % agarose gels (HiMedia) at 4v/cm in 0.5 X TBE buffer. Fragment sizes were approximately calculated by interpolation from the migration distance of marker fragments of 100 or 500 bp DNA ladder (Invitrogen, USA) depending on the amplified fragments size and corroborated with the reported amplified fragment size of respective molecular marker. The occurrence of 'null' alleles was verified by re-amplification using the same primer pair in the same conditions. Gels were stained with ethidium bromide (0.5ug/ml). DNA banding patterns were visualized with UV light and recorded by imagining system (Syngene Synoptics Ltd. USA).

Breeder and Nucleus Seed Production Programme of Barley (*Rabi*, 2019-20)

The indent and production of breeder and nucleus seed of barley varieties during Rabi 2019-20 has been described as below.

Breeder Seed Indent

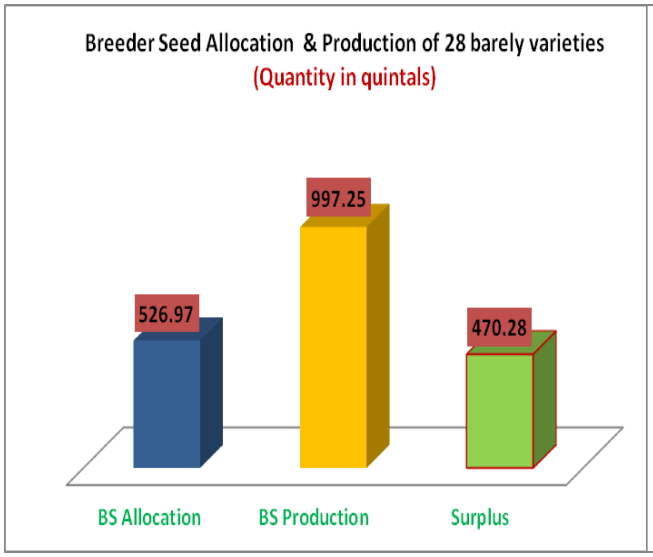
A consolidated quantity of 524.97q breeder seed indent of 26 varieties was received from Deputy Commissioner (Seeds), DAC&FW, Ministry of Agriculture & Farmers Welfare, Govt. of India. The indent included the requirement of eight states (Punjab, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh and Uttarakhand) and three public sector agencies (National Seeds Corporation, IFFDC & HIL,) and one private agency (National Seed Association of India) for the season Rabi 2019-20. The highest indent was placed by Rajasthan (220.01q) followed by Uttar Pradesh (120.0q) and National Seed Corporation (56.0q).

A total 526.97q breeder seed indent of 28 varieties was allocated among 12 BSP centres. Among 28 varieties maximum breeder seed indent was received for the variety RD 2786 (126.00q) followed by RD2794 (103.05q) and DWRUB137 (69.97q).

A total of 997.25q breeder seed of 28 varieties was produced by 12 BSP centres during 2019-20 which is significantly surplus (+470.28q) over the total allocated quantity (526.97) of breeder seed.

Among 12 breeder seed production centres maximum breeder seed was reported from RARI, Durgapura (552.45q surplus of 305.20q against allocation) followed by IIWBR, Karnal (218.0q with surplus of 76.43q) and CCSHAU, Hisar (119.10q with surplus 51.55q against 67.55q Allocation). NDUA&T, Faizabad and GBPUA&T, Pantnagar could not produce breeder seed of any of their variety.

A Total of 73.0q test stock multiplication of DWRB 160 was reported by NSC, New Delhi but due to unavailability of basic seed of PL 891 from PAU, Ludhiana the test stock of this variety could not multiply by NSC.



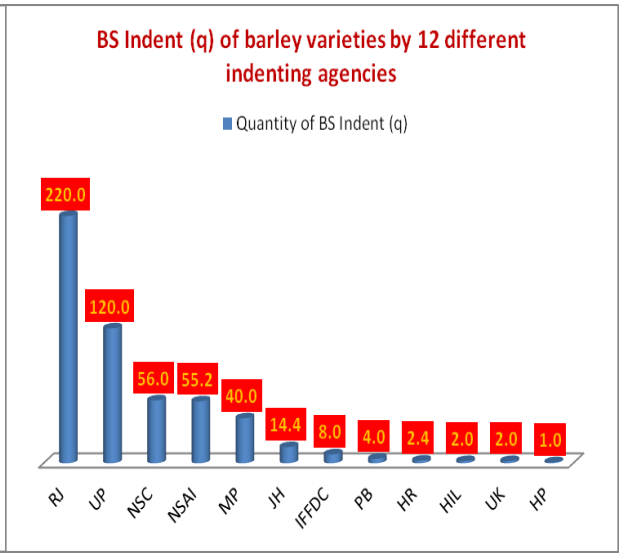


Table 3: Top ten indented varieties of barley and their production (q) during 2019-20

SN	Variety	Year of Notification	DAC Indent (q)	Production (q)
1	RD 2786	2013	126.00	190.00
2	RD 2794	2016	103.05	175.00
3	DWRB 137	2018	69.97	200.00
4	DWRB 101	2015	60.00	8.00
5	BH 946	2014	35.60	32.80
6	BH 959	2015	30.40	84.40
7	HUB 113 (Mahamana 113)	2014	20.00	20.25
8	JB 110 (Jawahar Barley-1)	2010	15.00	20.60
9	K 1055 (Prakhar)	2018	12.40	28.20
10	RD 2899	2018	11.80	20.00
		Total	484.22	779.25
	Per cent share in DAC Indent		92.24 %	

Table 4: Top Five BSP Centres of barley varieties during Rabi 2019-20.

SN	BSP Centre	DAC Indent	Allocation	Production	Surplus/Deficit ±
1	RARI, Durgapura	247.25	247.25	552.45	305.20
2	IIWBR Karnal	140.57	141.57	218.00	76.43
3	CCS HAU Hisar	67.55	67.55	119.10	51.55
4	JNKVV Jabalpur	20.00	20.00	32.55	12.55
5	CSAUA&T Kanpur	12.40	12.40	28.20	15.80

Table 1: Centre -wise Breeder and Nucleus Seed Indent and Production during 2019-20

SN	Centre	Variety	Year	Breeder seed				Nucleus Seed		
				Indent	Allocation	Production	Surplus/Deficit ±	Allocation	Production	Surplus/ Deficit ±
1	BHU Varanasi	HUB113(Mahamana113)	2014	20.00	20.00	20.25	0.25	1.00	1.05	0.05
2	CCS HAU Hisar	BH 946	2014	35.60	35.60	32.80	-2.80	1.50	2.00	0.50
		BH 959	2015	30.40	30.40	84.40	54.00	1.50	1.70	0.20
		BH 885	2012	0.60	0.60	0.80	0.20	0.10	0.50	0.40
		BH 902	2010	0.95	0.95	1.10	0.15	0.10	0.60	0.50
		Total			**67.55**	**119.10**	**51.55**	**3.20**	**4.80**	**1.60**
3	CSAUA&T Kanpur	K 1055 (Prakhar)	2018	12.40	12.40	28.20	15.80	0.50	3.00	2.50
4	GBPUAT Pantnagar	UPB 1008	2011	1.60	1.60	0.00	-1.60	0.10	0.20	0.10
5	HPKVV Palampur	HBL 713	2016	0.50	0.50	1.00	0.50	0.10	0.10	0.00
6	IARI RS Karnal	BHS 380	2019	0.50	0.50	0.50	0.00	0.10	0.45	0.35
7	IIWBR Karnal	DWRUB 64	2012	0.60	0.60	0.00	-0.60	0.10	0.10	0.00
		DWRB 101	2015	60.00	60.00	8.00	-52.00	2.50	2.00	-0.50
		DWRB 123	2017	10.00	10.00	0.00	-10.00	0.50	0.50	0.00
		DWRB 137	2018	69.97	69.97	200.00	130.03	3.00	3.00	0.00
		DWRB 160*	2019		1.00	10.00	9.00	0.50	0.50	0.00
		Total			**141.57**	**218.00**	76.43	**6.60**	**6.10**	-0.50
8	JNKVV Jabalpur	JB 58	2005	5.00	5.00	11.95	6.95	0.25	1.20	0.95
		JB 110 (Jawahar Barley-1)	2010	15.00	15.00	20.60	5.60	0.50	2.10	1.60
		Total			**20.00**	**32.55**	**12.55**	**0.75**	**3.30**	**2.55**
9	NDUA&T, Ayodhya	NBD 1445	2014	0.40	0.40	0.00	-0.40	0.10	0.00	-0.10
		NDB 1465	2014	10.00	10.00	0.00	-10.00	0.50	0.00	-0.50
		Total			**10.40**	**0.00**	-10.40	**0.60**	**0.00**	-0.60
10	PAU Ludhiana	PL 426	1996	3.00	3.00	20.00	17.00	0.10	2.00	1.90
		PL 807	2009	0.20	0.20	0.20	0.00	0.10	1.00	0.90
		PL 891*	2019		1.00	2.00	1.00	0.50	1.00	0.50
		Total			**4.20**	**22.20**	18.00	**0.70**	**4.00**	3.30
11	RARI, Durgapura	RD 2035	1994	5.00	5.00	160.00	155.00	0.25	2.50	2.25
		RD 2786	2013	126.00	126.00	190.00	64.00	5.00	4.00	-1.00
		RD 2849	2016	0.40	0.40	3.65	3.25	0.10	2.00	1.90
		RD 2794	2016	103.05	103.05	175.00	71.95	4.00	4.00	0.00
		RD 2907	2018	1.00	1.00	3.80	2.80	0.10	3.00	2.90
		RD 2899	2018	11.80	11.80	20.00	8.20	0.50	4.00	3.50
		Total			**247.25**	**552.45**	305.20	**9.95**	**19.50**	9.55
12	VPKAS Almora	VLB 118	2015	1.00	1.00	3.00	2.00	0.10	0.50	0.40
	Total			**524.97**	**526.97**	**997.25**	**470.28**	**23.7**	**43.00**	**19.30**

Table 2: Variety -wise Breeder and Nucleus Seed Indent and Production during 2019-20

SN	Variety	Year of Notification	Breeder Seed				Nucleus Seed		
			DAC Indent	Allocation	Production	Surplus/ Deficit ±	Allocation	Production	Surplus/ Deficit ±
1	BHS 380	2019	0.50	0.50	0.50	0.00	0.10	0.45	0.35
2	DWRB 160*	2019		1.00	10.00	9.00	0.50	0.50	0.00
3	PL 891*	2019		1.00	2.00	1.00	0.50	1.00	0.50
4	DWRB 137	2018	69.97	69.97	200.00	130.03	3.00	3.00	0.00
5	K 1055 (Prakhar)	2018	12.40	12.40	28.20	15.80	0.50	3.00	2.50
6	RD 2899	2018	11.80	11.80	20.00	8.20	0.50	4.00	3.50
7	RD 2907	2018	1.00	1.00	3.80	2.80	0.10	3.00	2.90
8	DWRB 123	2017	10.00	10.00	0.00	-10.00	0.50	0.50	0.00
9	HBL 713	2016	0.50	0.50	1.00	0.50	0.10	0.10	0.00
10	RD 2794	2016	103.05	103.05	175.00	71.95	4.00	4.00	0.00
11	RD 2849	2016	0.40	0.40	3.65	3.25	0.10	2.00	1.90
12	BH 959	2015	30.40	30.40	84.40	54.00	1.50	1.70	0.20
13	DWRB 101	2015	60.00	60.00	8.00	-52.00	2.50	2.00	-0.50
14	VLB 118 (VL Jau 118)	2015	1.00	1.00	3.00	2.00	0.10	0.50	0.40
15	BH 946	2014	35.60	35.60	32.80	-2.80	1.50	2.00	0.50
16	HUB 113 (Mahamana 113)	2014	20.00	20.00	20.25	0.25	1.00	1.05	0.05
17	NBD 1445(Narendra Barley 1445)	2014	0.40	0.40	0.00	-0.40	0.10	0.00	-0.10
18	NDB 1465	2014	10.00	10.00	0.00	-10.00	0.50	0.00	-0.50
19	RD 2786	2013	126.00	126.00	190.00	64.00	5.00	4.00	-1.00
20	BH 885	2012	0.60	0.60	0.80	0.20	0.10	0.50	0.40
21	DWRUB 64	2012	0.60	0.60	0.00	-0.60	0.10	0.10	0.00
22	UPB 1008	2011	1.60	1.60	0.00	-1.60	0.10	0.20	0.10
23	BH 902	2010	0.95	0.95	1.10	0.15	0.10	0.60	0.50
24	JB 110 (Jawahar Barley-1)	2010	15.00	15.00	20.60	5.60	0.50	2.10	1.60
25	PL 807	2009	0.20	0.20	0.20	0.00	0.10	1.00	0.90
26	JB 58	2005	5.00	5.00	11.95	6.95	0.25	1.20	0.95
27	PL 426	1996	3.00	3.00	20.00	17.00	0.10	2.00	1.90
28	RD 2035	1994	5.00	5.00	160.00	155.00	0.25	2.50	2.25
		Total	**524.97**	**526.97**	**997.25**	**+470.28**	**23.70**	**43.00**	**+19.30**

BARLEY CROP PROTECTION

Status of barley diseases and insect pests

Surveys were conducted in the farmers' fields by scientist from different cooperating centers for recording the presence of barley diseases and insects in their command area throughout the crop season 2018-19. The survey was inducted by Scientist from RARI, Durgapura in the area of Jaipur and Dausa districts and observed that farmers mainly grown RD2794, RD2035, RD2052, RD2052, RD2715 and RD2666 varieties of barley in the area. To know the status of barley diseases on farmers field, the survey was conducted on 22nd, 25th, 26th and 27th February, 2020 in the areas of district Jaipur and Dausa. During the survey yellow rust was observed from TS-10S on RD2035 and RD2052 at Kotpuptli. Loose and covered smuts were noted in traces- 3 percent in most of the area surveyed. *Drechslera* leaf stripe and bacterial streak were also noted in traces in some fields. Overall, the crop was healthy during the season. Farmers' fields in the areas of Haryana and Punjab was surveyed by the scientist of IIWBR, Karnal. Few very isolated fields of barley were observed. No rust was recorded during the survey in these areas. Survey team of CSAUA&T, Kanpur, reported the crop is generally good in area. However, the aphid infestation was observed in 02-03 aphid/plants in barley irrigated crop. Overall barley crop was healthy in all the barley growing areas in India.

During the 2019-20, survey was conducted to determine the incidence of insect-pests and their natural enemies on barley crop. At Ludhiana, Kanpur and Karnal locations, aphid infestation was observed to be moderate to high on barley crop. The natural enemies viz. grubs and adults of coccinellid beetles, syrphid fly and chrysoperla were observed in some of the fields infested with aphids. At Vijapur, survey of barley fields was carried out in the state during the crop season. The termite damage in barley fields remained low to moderate throughout the crop season. Besides, in barley fields the aphid population was moderate to high. Among natural enemies, predators like coccinellid beetles, chrysoperla and syrphid fly were frequently noticed predating on barley aphids.

Incidence of barley rusts and pathotype distribution during 2019-20

There was negligible incidence of barley rusts in India during 2019-20. Few sporadic incidents of barley stripe rust were reported from Northern India only. Stem and leaf rusts of barley were practically not reported from the farmer's fields. In stripe rust of barley (*P. striiformis hordei*) 10 samples were analyzed from Himachal Pradesh, Rajasthan and Nepal. Pathotypes 0S0(57) and 4S0(G) were most predominant whereas 1S0(M) was recorded in one sample only.

Table 1: Pathotype distribution of *P. striiformis hordei* on barley.

Country/ State	Sample	Pathotypes		
		1S0 (M)	0S0 (57)	4S0 (G)
Himachal Pradesh	8	01	03	04
Rajasthan	1	-	01	-
Nepal	1	-	01	-
Total	10	01	05	04

Observation of any new barley diseases/ insect pests:

To observe the appearance of any quarantine pests on barley crop the nurseries were observed for any new symptoms during the crop season till the harvest. There was no report from any centre for presence of any of following quarantined pests (disease / insect pest) in their respective areas during the crop season 2019-20.

i.	Glume rot	-	Not reported by any centre
ii.	Barley stripe mosaic	-	Not reported by any centre
iii.	Ergot	-	Not reported by any centre

Status of resistance in breeding lines and advanced entries:

Adult plant resistance (APR)

A total 577 barley breeding lines were screened during the crop season 2018-19 under various nurseries (IBDSN, NBDSN and EBDSN) for resistance against various diseases, aphid and CCN at different cooperating centers. There were 404 entries under IBDSN, 129 were for NBDSN and 44 for EBDSN (Fig. 1). Seedling Resistance Test (SRT) for NBDSN and EBDSN entries was conducted at DWR Regional station, Shimla.

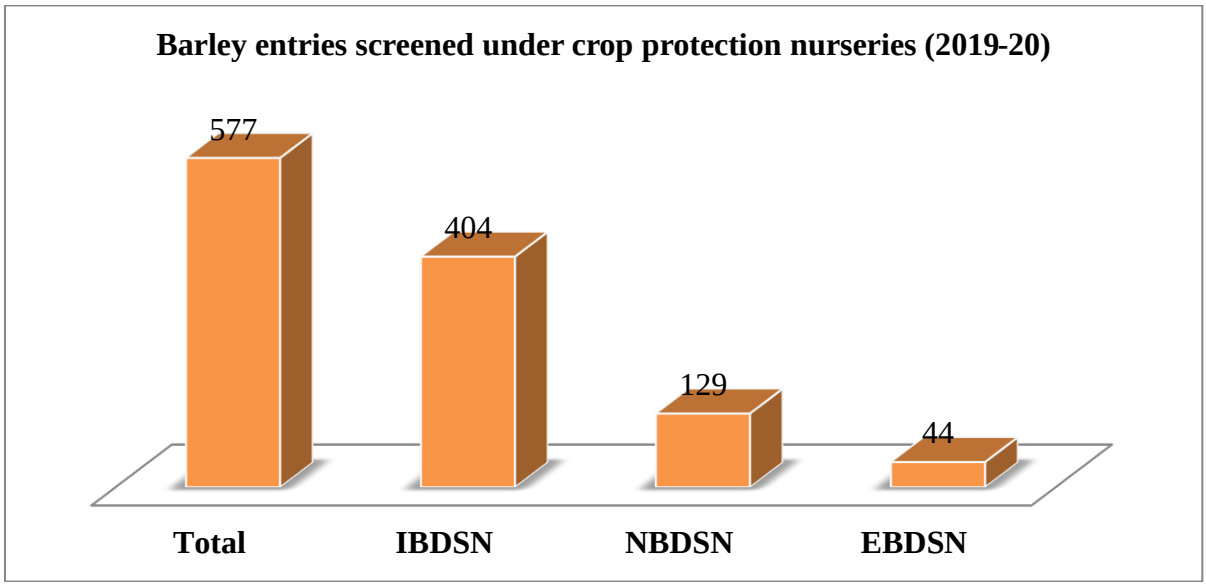


Fig.1: Barley entries screened under crop protection nurseries (2019-20)

Besides the screening of barley germplasm for disease resistance, experiments on chemical control of yellow were conducted at various locations to evaluate the efficacy of various fungicides for management of yellow rust. NBDSN entries were also screened for aphid at five locations viz., Kanpur, Ludhiana and Karnal and for CCN resistance at three locations Ludhiana, Hisar, and Durgapura.

Initial Barley Disease Screening Nursery (IBDSN) 2019-20

During the current season 2019-20 a total 404 entries under IBDSN were screened for resistance against major diseases viz., stripe rust and leaf blight at various coordinating centres. The screening of stripe rust was done at Durgapura, Ludhiana, Almora, Bajaura, Jammu and Karnal. The screening for leaf blight was done at Pantnagar, Varanasi, Kanpur and Faizabad.

To create the epiphytotic condition for yellow rust the inocula were supplied by IIWBR Regional Station, Flowerdale, Shimla and multiplied in respective centres for creating epiphytotics in the main field from tillering to flag leaf stage. The scoring of disease was done based on response and severity. Leaf blight inoculum supplied by IIWBR, Karnal centre and inoculation by centres in the field was done and the scoring of blight disease was done at dough stage in double digit scale on flag leaf (F) and F-1 leaf. For the rusts, average coefficient of infection (ACI) was calculated along with highest score. The entries showing ACI up to 10.00

for rusts were considered resistant (R). For leaf blight, average disease score in double digit system was calculated along with highest score, the genotypes showed an average score of 00-13 with highest score up to 35 at multilocation were considered resistant and genotypes with average score of 14-35 with HS 57 were considered moderately resistant (MR).

Among 404 entries evaluated during 2019-20 (Table 2), only 2 entries were found free from yellow rust (ACI = 0) and 163 entries showed resistant reaction having ACI less than 10. In case of leaf blight screening, 35 entries were found moderately resistant against leaf blight with an average score (double digit) 14-35 and HS < 57.

Yellow rust, ACI = 0, Entries – 1	UPBM 2 and UPBM 9
Yellow rust, ACI > 0 to 10, Entries – 163	LK-19/1, LK-19/3, LK-19/4, LK-19/5, LK-19/6, LK-19/7, LK-19/8, LK-19/10, LK-19/11, LK-19/12, LK-19/13, LK-19/14, LK-19/15, LK-19/16, DWRFB 30, DWRFB 31, DWRFB 32, DWRFB 33, DWRFB 34, DWRFB 35, DWRFB 36, DWRFB 38, DWRFB 65, DWRFB 67, DWRFB 72, DWRFB 73, DWRFB 77, DWRFB 80, DWRFB 81, DWRFB 82, DWRFB 84, DWRFB 85, BBM 828, BBM 830, BBM 833, BBM 834, BBM 835, BBM 838, BBM 839, BBM 840, BBM 841, BBM 842, BBM 843, BBM 845, BBM 846, BBM 848, BBM 851, BBM 852, BBM 853, BBM 854, BBM 855, BBM 856, BBM 857, BBM 858, BBM 859, BBM 860, UPBM 1, UPBM 5, UPBM 6, UPBM 7, UPBM 8, UPBM 10, UPBM 13, PKB 1912, PKB 1916, PKB 1927, PKB 1931, PKB 1936, PKB 1937, PKB 1939, PKB 1941, PKB 1942, PKB 1943, PKB 1946, PKB 1947, BL 1515, BL 1537, BL 1539, BL 1607, BL 1608, BL 1617, BL 1643, BL 1728, BL 1731, BL 1747, BL 1748, BL 1751, BH-1902, BH-1903, BH-1907, BH-1908, BH-1909, BH-1913, BH-1914, BH-1915, BH-1916, BH-1917, BH-1918, BH-1920, BH-1921, BH-1922, BH-1925, BH-1927, BH-1928, BH-1929, BH-1932, BH-1939, BH-1940, BH-1941, BH-1942, BH-1943, BH-1944, BH-1945, BH-1946, BH-1947, BH-1949, BH1952, HUBL-1912, HUBL-1917, HUBL-1920, HUBL-1930, HB-1901, HB-1902, HB-1903, HB-1904, HB-1906, HB-1907, HB-1909, HB-1910, HB-1911, HB-1912, HB-1913, HB-1916, HB-1917, HB-1918, HB-1919, VB-1901, VB-1902, VB-1904, VB-1909, VB-1916, VB-1917, BD-1832, BD-1833, BD-1835, BD-1836, BD-1841, BD-1844, BD-1846, BD-1847, BD-1848, BD-1849, BD-1850, BD-1853, BD-1855, BD-1856, BD-1857, BD-1866, BD-1867, BD-1868, NDB-1754, NDB-1756 and NDB-1757
Leaf blight, Avg. 14-35 with HS < 57, Entries - 4	DWRFB 58, BD-1831, HB-1917 and VB-1927

Table 2: Reactions of different entries of barley in Initial Barley Disease Screening Nursery (IBDSN), 2019-20

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
IIWBR, Karnal					
1	LK-19/1	7.8	20S	46	68
2	LK-19/2	10.9	40S	47	68
3	LK-19/3	2.3	5S	57	89
4	LK-19/4	0.3	5MR	58	89
5	LK-19/5	3.4	10S	57	89
6	LK-19/6	9	20S	57	89
7	LK-19/7	2.6	10S	57	89
8	LK-19/8	5.3	10S	57	89
9	LK-19/9	16.7	40S	57	78
10	LK-19/10	3.3	5S	46	68

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
11	LK-19/11	1.8	10S	46	68
12	LK-19/12	3.5	10S	57	89
13	LK-19/13	1.8	10S	46	68
14	LK-19/14	1.5	10MS	56	89
15	LK-19/15	4.3	20S	57	89
16	LK-19/16	2.5	10S	57	89
17	LK-19/17	23.3	40S	57	89
18	LK-19/18	21.8	60S	57	78
IIWBR, Hisar					
19	DWRFB 30	2	10S	68	89
20	DWRFB 31	0.8	5MS	57	89
20A	**Infector**	**83.3**	**100S**	**89**	**99**
21	DWRFB 32	1	5MS	56	78
22	DWRFB 33	3.7	20S	46	89
23	DWRFB 34	4	20S	57	89
24	DWRFB 35	3.4	10S	57	89
25	DWRFB 36	1.8	5S	57	78
26	DWRFB 37	20.7	60S	67	89
27	DWRFB 38	3.7	20S	57	89
28	DWRFB 39	16.7	40S	57	89
29	DWRFB 40	40	80S	78	99
30	DWRFB 41	45	60S	57	99
31	DWRFB 42	55	100S	57	89
32	DWRFB 43	21.7	80S	78	99
33	DWRFB 44	35.1	60S	78	79
34	DWRFB 45	57.5	80S	68	79
35	DWRFB 46	54.2	80S	78	99
36	DWRFB 47	46.7	80S	57	89
37	DWRFB 48	38.8	80S	58	79
38	DWRFB 49	33.3	60S	45	68
39	DWRFB 50	30	60S	46	68
40	DWRFB 51	30.8	60S	57	89
40A	**Infector**	**80**	**100S**	**89**	**99**
41	DWRFB 52	12	40S	67	89
42	DWRFB 53	30.8	80S	58	99
43	DWRFB 54	34.7	80S	78	99
44	DWRFB 55	27	40S	68	89
45	DWRFB 56	18.3	40S	68	79
46	DWRFB 57	18	60S	68	99
47	DWRFB 58	48.3	80S	35	35
48	DWRFB 59	44.7	80S	57	68
49	DWRFB 60	30.3	60S	57	99
50	DWRFB 61	39.5	80S	57	78
51	DWRFB 62	31.3	80S	68	89
52	DWRFB 63	50.1	80S	68	89
53	DWRFB 64	12.3	60S	79	99
54	DWRFB 65	1.8	5S	89	99
55	DWRFB 66	40	80S	89	99
56	DWRFB 67	4.7	20S	57	68
57	DWRFB 68	28	60S	57	68
58	DWRFB 69	32.7	80S	57	89

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
59	DWRFB 70	43.3	80S	79	99
60	DWRFB 71	13.7	60S	78	78
60A	**Infector**	**83.3**	**100S**	**89**	**99**
61	DWRFB 72	4.5	10S	78	79
62	DWRFB 73	7.8	30S	89	99
63	DWRFB 74	18.3	40S	57	89
64	DWRFB 75	48	100S	78	99
65	DWRFB 76	42.5	80S	57	79
66	DWRFB 77	4.8	20S	78	89
67	DWRFB 78	51.7	80S	78	89
68	DWRFB 79	17.8	60S	79	99
69	DWRFB 80	4.2	20MS	78	99
70	DWRFB 81	0.7	5MS	89	99
71	DWRFB 82	7	40S	68	99
72	DWRFB 83	23.3	40S	68	89
73	DWRFB 84	6.2	15S	58	89
74	DWRFB 85	10	40S	57	89
75	DWRFB 86	11.7	40S	57	78
IARI, RS, Shimla					
76	BBM 828	8.7	40MS	78	89
77	BBM 829	10.2	40MS	58	78
78	BBM 830	8.7	40S	68	89
79	BBM 831	43.3	80S	78	99
80	BBM 832	10.8	60S*	78	89
80A	**Infector**	**76.7**	**100S**	**89**	**99**
81	BBM 833	0.7	10MR	68	89
82	BBM 834	4.3	20S	78	99
83	BBM 835	2	10S	78	99
84	BBM 836	26.7	80S	89	99
85	BBM 837	12.6	60S	78	89
86	BBM 838	2	10MS	89	89
87	BBM 839	0.1	TMR	78	99
88	BBM 840	9	20S	78	79
89	BBM 841	6.2	20S	79	89
90	BBM 842	5.7	20S	89	99
91	BBM 843	2.8	10S	68	89
92	BBM 844	32	80S	68	89
93	BBM 845	7.7	20S	88	99
94	BBM 846	8.7	40MS	78	89
95	BBM 847	15.8	40S	68	89
96	BBM 848	5.1	10S	78	99
97	BBM 849	16.7	60S	78	99
98	BBM 850	10.3	30MS	78	99
99	BBM 851	3	10S	68	99
100	BBM 852	1.3	5MS	78	99
100A	**Infector**	**83.3**	**100S**	**89**	**99**
101	BBM 853	3.7	10S	89	99
102	BBM 854	1	5MS	78	89
103	BBM 855	4	20S	67	99
104	BBM 856	3	10MS	57	67
105	BBM 857	3.2	10S	57	69

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
106	BBM 858	3.5	10MS	78	99
107	BBM 859	3.5	10MS	58	89
108	BBM 860	2.2	10MS	78	99
GBPUAT, Pantnagar					
109	UPBM 1	3	10S	68	99
110	UPBM 2	0	0	79	99
111	UPBM 3	23.2	60S	68	89
112	UPBM 4	55	80S	46	57
113	UPBM 5	4.8	20S	68	78
114	UPBM 6	9.2	40S	68	79
115	UPBM 7	2.5	10S	68	89
116	UPBM 8	2.2	10MS	68	89
117	UPBM 9	0	TR	57	68
118	UPBM 10	4.2	20S	68	89
119	UPBM 11	19.2	60S	68	78
120	UPBM 12	14.4	40S	68	78
120A	**Infector**	**73.3**	**100S**	**89**	**99**
121	UPBM 13	8.3	20S	68	79
122	UPBM 14	42.2	80S	68	99
123	UPBM 15	51.7	80S	57	89
124	UPBM 16	14.1	80S*	58	78
125	UPBM 17	13.2	20S	57	89
126	UPBM 18	18.5	40S	79	99
CSAUAT, Kanpur					
127	PKB 1901	30.5	80S	68	79
128	PKB 1902	12.3	40S	67	89
129	PKB 1903	50	80S	78	89
130	PKB 1904	51.7	80S	68	78
131	PKB 1905	45	80S	58	89
132	PKB 1906	43.3	60S	68	79
133	PKB 1907	60	80S	68	78
134	PKB 1908	66.7	80S	68	89
135	PKB 1909	12.8	60S*	68	78
136	PKB 1910	39	80S	57	67
137	PKB 1911	11.3	60S*	68	78
138	PKB 1912	0.7	5MS	68	89
139	PKB 1913	56.7	80S	68	89
140	PKB 1914	21.5	60S	68	89
140A	**Infector**	**76.7**	**100S**	**79**	**99**
141	PKB 1915	46.7	80S	78	89
142	PKB 1916	0.1	TMR	78	78
143	PKB 1917	56.7	80S	57	68
144	PKB 1918	46.7	80S	68	99
145	PKB 1919	66.7	80S	68	89
146	PKB 1920	60	80S	68	78
147	PKB 1921	63.3	80S	67	89
148	PKB 1922	38.3	80S	78	89
149	PKB 1923	35	60S	67	78
150	PKB 1924	73.3	80S	68	89
151	PKB 1925	60	80S	68	78
152	PKB 1926	20	40S	68	99

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
153	PKB 1927	6.7	40S	79	89
154	PKB 1928	66.7	80S	89	99
155	PKB 1929	45	60S	78	99
156	PKB 1930	70	80S	78	79
157	PKB 1931	1.6	5S	78	99
158	PKB 1932	70	100S	78	99
159	PKB 1933	40	60S	68	89
160	PKB 1934	56.7	80S	68	78
160A	**Infector**	**73.3**	**100S**	**89**	**99**
161	PKB 1935	70	80S	67	78
162	PKB 1936	5.7	20MS	68	99
163	PKB 1937	2.5	10S	89	99
164	PKB 1938	50.8	80S	78	99
165	PKB 1939	8.7	20S	78	99
166	PKB 1940	26.3	60S	57	78
167	PKB 1941	3	10S	57	78
168	PKB 1942	8.7	20MS	57	68
169	PKB 1943	9.5	20S	68	79
170	PKB 1944	11.5	30S	68	99
171	PKB 1945	12.7	30S	68	99
172	PKB 1946	5.5	15S	78	99
173	PKB 1947	0.1	TMR	67	99
174	PKB 1948	41.7	80S	78	99
PAU, Ludhiana					
175	BL 1508	33.3	60S	67	99
176	BL 1515	1.7	10S	78	99
177	BL 1523	18.5	40S	68	79
178	BL 1531	20	40S	57	79
179	BL 1534	12.8	40S	68	89
180	BL 1537	3.1	10S	79	99
180A	**Infector**	**76.7**	**100S**	**89**	**99**
181	BL 1539	5.5	15S	79	89
182	BL 1544	23.5	40S	68	89
183	BL 1607	8.5	20MS	78	99
184	BL 1608	9.5	20S	57	78
185	BL 1617	7.8	30S	57	89
186	BL 1643	3.3	20MS	57	89
187	BL 1714	18.5	40S	46	57
188	BL 1715	10.7	30S	57	89
189	BL 1718	17.2	40S	57	78
190	BL 1719	16.8	40S	47	89
191	BL 1720	17.7	40S	57	89
192	BL 1725	16.7	40MS	46	78
193	BL 1728	4	20MS	68	99
194	BL 1730	34.3	60S	46	58
195	BL 1731	1.6	5S	57	78
196	BL 1733	46.7	60S	47	57
197	BL 1736	41.7	60S	46	57
198	BL 1740	13.3	40S	68	99
199	BL 1745	15.7	40S	58	79
200	BL 1747	8.7	20S	57	89

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
200A	**Infector**	**80**	**100S**	**99**	**99**
201	BL 1748	1.7	10S	58	68
202	BL 1749	21.7	40S	78	99
203	BL 1751	5.1	10S	68	89
204	BL 1753	41.7	80S	47	68
205	BL 1754	30	80S	68	89
206	BL 1756	20	40S	46	57
207	BL 1757	26.7	60S	57	99
208	BL 1760	31.7	60S	46	57
209	BL 1761	33.3	60S	46	57
210	BL 1766	38.3	80S	68	99
211	BL 1770	46.7	80S	57	67
212	BL 1772	43.3	60S	57	58
213	BL 1775	43.3	60S	47	68
214	BL 1777	50	80S	68	89
215	BL 1778	43.3	60S	58	89
216	BL 1780	43.3	80S	57	78
217	BL 1781	46.7	80S	47	58
218	BL 1785	50	80S	46	58
219	BL 1786	24.3	40S	57	78
220	BL 1787	16	40S	57	89
220A	**Infector**	**76.7**	**100S**	**88**	**99**
221	BL 1789	40	60S	57	89
222	BL 1797	24.2	40S	67	89
223	BL 1799	18.5	40S	46	46
224	BL 1800	25	60S	68	89
225	BL 1804	18.8	40S	57	89
226	BL 1807	34.7	60S	57	68
227	BL 1808	34.7	60S	68	78
228	BL 1810	29.2	40S	68	89
229	BL 1812	21.8	40S	57	99
CCSHAU, Hisar					
230	BH- 1901	14	40S	57	99
231	BH-1902	3.4	10S	68	99
232	BH-1903	8.7	40S	78	99
233	BH-1904	20.2	40S	57	89
234	BH-1905	15.7	40S	67	89
235	BH-1906	14.5	40S	78	99
236	BH-1907	5.8	15S	46	68
237	BH-1908	0.7	5MS	67	89
238	BH-1909	7.3	20S	68	99
239	BH-1910	12	40S	68	99
240	BH-1911	12.8	40S	67	89
240A	**Infector**	**80**	**100S**	**89**	**99**
241	BH-1912	13.3	40S	57	99
242	BH-1913	9.7	20S	68	89
243	BH-1914	2.7	10S	58	89
244	BH-1915	3.1	10S	57	99
245	BH-1916	3	10S	57	78
246	BH-1917	1.7	5S	68	89
247	BH-1918	8.3	40S	47	58

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
248	BH-1919	23.7	40S	68	78
249	BH-1920	9	20S	57	89
250	BH-1921	2.5	10S	58	78
251	BH-1922	6	20MS	57	99
252	BH-1923	24.7	60S	46	89
253	BH-1924	16.3	40S	57	79
254	BH-1925	8.3	20S	57	99
255	BH-1926	11.3	20S	57	89
256	BH-1927	9.2	20S	45	56
257	BH-1928	5.7	20S	45	46
258	BH-1929	4.7	10S	46	58
259	BH-1930	11.7	40S	46	58
260	BH-1931	16.8	40S	68	78
260A	**Infector**	**70**	**100S**	**89**	**99**
261	BH-1932	5.5	15S	57	78
262	BH-1933	19.8	60S	78	99
263	BH-1934	18	40S	78	99
264	BH-1935	23.8	60S	79	99
265	BH-1936	23.3	60S	78	99
266	BH-1937	26	60S	78	99
267	BH-1938	20	40S	78	99
268	BH-1939	2	10MS	67	89
269	BH-1940	4.7	20S	78	99
270	BH-1941	4.7	15S	67	89
271	BH-1942	4.8	15S	68	79
272	BH-1943	0.7	5MS	67	99
273	BH-1944	6	20S	58	89
274	BH-1945	1.5	10MS	46	78
275	BH-1946	3.8	10S	57	78
276	BH-1947	6.5	20S	56	89
277	BH-1948	23	60S	57	89
278	BH-1949	1	5MS	57	99
279	BH-1950	10.5	60S*	56	99
280	BH-1951	23.3	60S	67	89
280A	**Infector**	**80**	**100S**	**89**	**99**
281	BH1952	8.7	40S	68	89
BHU, Varanasi					
282	HUBL-1901	56.7	100S	67	89
283	HUBL-1902	34.8	80S	68	89
284	HUBL-1903	31	60S	57	99
285	HUBL-1904	54.7	100S	68	99
286	HUBL1905	19.3	40S	68	99
287	HUBL1906	28	60S	68	99
288	HUBL1907	60	100S	68	99
289	HUBL1908	66.7	100S	78	99
290	HUBL-1909	63.3	100S	46	68
291	HUBL-1910	66.7	100S	57	78
292	HUBL-19011	54	100S	67	99
293	HUBL-1912	2	10S	57	67
294	HUBL-1913	12.7	60S	67	99
295	HUBL-1914	63.3	100S	57	99

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
296	HUBL-1915	66.7	100S	68	99
297	HUBL-1916	36.2	80S	68	99
298	HUBL-1917	6.2	20MS	68	89
299	HUBL-1918	66.7	100S	89	99
300	HUBL-1919	73.3	100S	78	89
300A	**Infector**	**80**	**100S**	**89**	**99**
301	HUBL-1920	9.7	30S	58	89
302	HUBL-1921	35	60S	46	68
303	HUBL-1922	21.2	40S	46	89
304	HUBL-1923	63.3	100S	57	89
305	HUBL-1924	66.7	100S	57	89
306	HUBL-1925	58.3	100S	68	99
307	HUBL-1926	55	100S	68	99
308	HUBL-1927	58.3	100S	57	99
309	HUBL-1928	53.3	100S	57	78
310	HUBL-1929	53	100S	56	86
311	HUBL-1930	1.6	5S	67	89
HAREC, CSKHPKV, Bajaura					
312	HB-1901	0.3	5MR	67	99
313	HB-1902	5.2	20S	78	99
314	HB-1903	0.1	TMR	67	78
315	HB-1904	2.5	10S	78	89
316	HB-1905	26.7	60S	57	69
317	HB-1906	1.2	5S	46	68
318	HB-1907	8.5	20S	46	78
319	HB-1908	23.7	40S	57	68
320	HB-1909	2.7	20MS	67	89
320A	**Infector**	**76.7**	**100S**	**78**	**89**
321	HB-1910	3.8	15S	68	78
322	HB-1911	4.4	20S	57	89
323	HB-1912	3.1	10S	68	89
324	HB-1913	9	30S	46	68
325	HB-1914	14.2	40S	57	78
326	HB-1915	19.2	60S	57	79
327	HB-1916	9	20S	57	79
328	HB-1917	5.5	15S	36	46
329	HB-1918	9	20S	67	89
330	HB-1919	9.3	20S	47	68
331	HB-1920	12.4	30MS	46	67
VPKAS, Almora					
332	VB-1901	5.3	20S	57	68
333	VB-1902	9.7	20S	57	58
334	VB-1903	12.2	30S	68	78
335	VB-1904	6.8	15S	47	68
336	VB-1905	13.2	30S	46	68
337	VB-1906	18.5	40S	57	67
338	VB-1907	13.8	40S	47	79
339	VB-1908	35.2	80S	67	79
340	VB-1909	8.7	40S	68	99
340A	**Infector**	**73.3**	**100S**	**89**	**99**
341	VB-1910	13.3	30S	58	68

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
342	VB-1911	23.2	40S	57	68
343	VB-1912	17.3	40S	67	79
344	VB-1913	17.3	40S	56	79
345	VB-1914	14.7	40S	78	99
346	VB-1915	20.7	40S	67	99
347	VB-1916	7.3	20MS	68	99
348	VB-1917	1.4	10MS	47	68
349	VB-1918	21.8	60S	57	78
350	VB-1919	13.5	40S	47	58
351	VB-1920	12.5	30S	48	58
352	VB-1921	12.3	30S	57	68
353	VB-1922	11	20S	46	58
354	VB-1923	14.8	30S	57	68
355	VB-1924	14.3	40S	57	67
356	VB-1925	15.8	40S	56	78
357	VB-1926	19.2	60S	56	68
358	VB-1927	21.5	60S	36	46
359	VB-1928	23.5	60S	46	58
RARI, Durgapura					
360	BD-1831	34.2	80S	35	57
360A	**Infector**	**73.3**	**100S**	**89**	**89**
361	BD-1832	2.6	10S	67	78
362	BD-1833	3.5	10S	67	79
363	BD-1834	12	20S	68	79
364	BD-1835	4.7	15S	68	78
365	BD-1836	7.8	20S	67	78
366	BD-1837	18.1	40S	68	68
367	BD-1838	13.8	40S	57	68
368	BD-1839	14.2	30S	57	89
369	BD-1840	21.7	40S	57	78
370	BD-1841	5.3	20S	57	68
371	BD-1842	32.5	60S	68	89
372	BD-1843	22.5	80S	68	89
373	BD-1844	1.9	5S	78	99
374	BD-1845	41.7	80S	68	89
375	BD-1846	1.4	10MS	58	89
376	BD-1847	1.2	5S	57	78
377	BD-1848	1.2	5S	78	99
378	BD-1849	2.2	5S	68	78
379	BD-1850	0.1	TMS	79	99
380	BD-1851	24.2	60S	57	68
380A	**Infector**	**80**	**100S**	**68**	**89**
381	BD-152	60	100S	78	99
382	BD-1853	1.7	10S	79	89
383	BD-1854	15.7	40S	68	79
384	BD-1855	1.7	10S	68	89
385	BD-1856	3	10S	68	89
386	BD-1857	6.8	20S	68	89
387	BD-1858	30.8	60S	57	79
388	BD-1859	31.7	40S	46	68
389	BD-1860	30.5	80S	57	69

IBDSN No.	Entries	Yellow rust		Foliar blight	
		ACI	HS	Avg.	HS
390	BD-1861	18.3	40S	57	79
391	BD-1862	29.7	80S	68	99
392	BD-1863	14.2	40S	57	78
393	BD-1864	36.7	80S	57	68
394	BD-1865	46.3	80S	78	99
395	BD-1866	4.3	20MS	57	79
396	BD-1867	8.3	20S	57	79
397	BD-1868	1.8	5S	58	69
398	BD-1869	53.3	80S	68	79
399	BD-1870	56.7	80S	57	68
NDUA, Faizabad					
400	NDB-1752	23.8	60S	57	78
400A	**Infector**	**76.7**	**100S**	**78**	**89**
401	NDB-1754	1.4	10MS	68	99
402	NDB-1756	9.1	20MS	57	79
403	NDB-1757	0.7	5MS	78	99
404	NDB-1763	25.8	60S	78	89

HS- Highest Score, Avg. - Average, ACI- Average Coefficient of Infection

National Barley Disease Screening Nursery (NBDSN) 2019-20

During the crop season 2019-20, under the NBDSN trial a total 116 entries from IVT yield trials including checks were screened against stripe rust, leaf rust, stem rust, leaf blight, aphids and cereal cyst nematode (CCN) at hot spot locations.

The NBDSN entries were screening for stripe rust resistance at hot spot centers that include Durgapura, Ludhiana, Hisar, Almora, Bajaura, Jammu and Karnal. Leaf rust screening was done at Ludhiana and Jammu, and only two locations were there, so HS is reflected in table. The scoring for stem rust was done at Dharwad. The leaf blight screening was done at Dharwad, Pantnagar, Varanasi, Kanpur and Faizabad. CCN screening was done at Hisar, Durgapura and Ludhiana centers. For CCN, the number of nematode cysts/plants was counted and entries having 0-4 cysts/ plant in pot were considered as resistant (R) whereas those with cysts/plant 4.1-9.0 were Moderately Resistant (MR). The entries with galls between 9.1 and 20.0 were treated as susceptible (S) and the entries with more than 20.0 galls per plant were treated as highly susceptible (HS).

Out of 116 entries evaluated during 2019-20 (Table 3), 58 entries showed resistant reaction having ACI less than 10. In case of leaf blight screening, RD3017 found moderately resistant against leaf blight with an average score (double digit) 14-35 but HS was higher than 57 because of high disease at one location. The center wise data is presented in Table 5.

The resistant entries identified against yellow rust and blight are given below:

Yellow rust, ACI = 0,	No entry found free from yellow rust
Yellow rust, ACI > 0 to 10, Entries – 58	BH1029, BH1030, BH1032, BH1033, BH946 (C), BHS352(C), BHS478, BHS479, BHS481, BHS482, DWRB123 (C), DWRB137(C), DWRB182, DWRB197, DWRB210, DWRB211, DWRB217, HBL113(C), HBL865, HBL866, HBL868, HUB271, HUB272, HUB69, KB1707, KB1817, KB1822, KB1830, KB1843, NDB1742, NDB1748, PL906, PL908, PL911, PL917, RD2552(C), RD2794(C), RD2849 (C), RD2899(C), RD2907(C), RD2994, RD3013, RD3015, RD3016, RD3020, RD3021, RD3023, RD3024, RD3026, UPB1080, UPB1083, UPB1085, UPB1086, UPB1088, VLB118(C), VLB166, VLB168 and VLB169
Leaf blight, Avg. 13-35 with HS < 57*	RD3017

**HS has been more due to one location only.*

Table 3: Reactions of different entries of barley in National Barley Disease Screening Nursery (NBDSN), 2019-20

S. No.	Entry	Yellow rust		Leaf rust	Stem rust	Foliar blight		Foliar aphid		CCN
		ACI	HS	HS	HS	Avg.	HS	Avg.	HS	HS
1.	ABI Kranti	28.9	80S	5S	0	56	78	4.7	5.0	S
2.	BH1026	16.6	40S	5MS	0	68	89	4.3	5.0	HS
3.	BH1027	20.7	40S	TMS	10MS	57	89	4.9	5.0	S
4.	BH1028	37.9	80S	0	0	57	89	3.8	5.0	HS
5.	BH1029	2.4	5S	5S	5MS	68	89	4.4	5.0	S
6.	BH1030	2.9	15S	20MS	0	57	99	4.7	5.0	S
7.	BH1031	23.4	40S	10MS	0	57	89	4.6	5.0	S
8.	BH1032	4.9	20S	5S	0	68	99	4.8	5.0	S
9.	BH1033	3.3	15S	0	0	57	89	4.7	5.0	S
10.	BHS478	8.6	40S	5S	5S	68	89	4.1	4.3	S
11.	BHS479	5.8	40S	TMS	0	89	99	4.8	5.0	S
12.	BHS480	19.4	40S	20S	5MS	57	78	5.0	5.0	S
13.	BHS481	6.9	40S	0	5MS	67	89	4.4	5.0	S
14.	BHS482	2.9	20S	TMS	10S	88	99	4.3	5.0	S
15.	DWRB182	3.2	20S	20S	5MS	46	78	4.9	5.0	S
16.	DWRB196	19.3	40S	5MS	5MS	78	89	4.3	5.0	S
17.	DWRB197	1.1	5MS	20MS	5MS	46	68	4.9	5.0	HS
18.	DWRB204	24.9	60S	10S	0	57	78	4.4	5.0	HS
19.	DWRB209	18	60S	0	0	67	99	4.6	5.0	HS
20.	DWRB210	1	5MS	20MS	0	57	99	4.9	5.0	HS
21.	DWRB211	2.2	10S	TS	0	57	89	4.4	5.0	HS
22.	DWRB212	20	60S	5MS	0	57	89	4.4	5.0	HS
23.	DWRB213	25.6	80S	TS	0	46	78	4.6	5.0	S
24.	DWRB214	32.9	60S	5S	0	78	99	4.8	5.0	S
25.	DWRB215	30.1	80S	0	5MS	67	99	4.7	5.0	S
26.	DWRB216	23.6	60S	5MR	10S	56	78	4.8	5.0	S
27.	DWRB217	4	10S	5MS	10S	56	78	4.5	5.0	HS
28.	HBL864	20	40S	5S	0	57	89	4.9	5.0	S
29.	HBL865	2.9	20S	20S	10MS	78	99	4.8	5.0	HS
30.	HBL866	6.7	20S	0	5S	68	89	4.3	5.0	S
31.	HBL867	15.4	40S	5MS	5S	68	89	3.4	4.3	S
32.	HBL868	9.3	60S*	10S	10S	57	78	4.6	5.0	HS
33.	HUB270	17.7	40MS	0	0	46	78	4.6	5.0	HS
34.	HUB271	7.9	40MS	20S	0	57	89	4.8	5.0	S
35.	HUB272	2.9	10S	TMS	0	56	89	4.7	5.0	S
36.	HUB273	42.9	80S	0	0	46	57	4.9	5.0	S
37.	HUB274	34.9	60S	20MR	0	46	78	4.8	5.0	S
38.	HUB69	0.1	TMR	20S	10MS	67	79	4.2	4.3	S
39.	K1149	52.5	80S	20S	10MS	46	78	4.8	5.0	HS
40.	Karan16	24.9	60S	40S	10MS	67	89	4.5	5.0	S

41.	KB1707	1.2	10MS	20S	10MS	68	89	4.6	5.0	S
42.	KB1815	31.6	60S	20MS	0	57	68	4.7	5.0	HS
43.	KB1816	37.9	60S	5MS	0	68	89	4.8	5.0	S
44.	KB1817	5.9	30S	0	0	57	89	4.1	4.3	S
45.	KB1822	6.1	40S	5MS	10MS	78	99	4.8	5.0	S
46.	KB1830	4.8	20S	0	0	46	78	4.4	5.0	HS
47.	KB1832	26.4	40S	TS	20S	57	89	5.0	5.0	HS
48.	KB1843	8.5	30S	0	10MS	67	89	4.4	5.0	S
49.	KB1845	17.9	60S	20S	5MS	46	56	4.9	5.0	S
50.	KB1848	50	80S	10MS	5MS	46	67	5.0	5.0	S
51.	NDB1730	19.9	60S	TMS	10S	46	78	4.9	5.0	S
52.	NDB1738	32.9	60S	10MS	0	57	89	4.4	4.7	HS
53.	NDB1742	8.6	40S	0	10MS	57	78	4.8	5.0	S
54.	NDB1748	5.7	20S	10MS	0	46	67	4.3	5.0	HS
55.	PL906	4.6	10S	20S	10MS	57	79	4.2	5.0	S
56.	PL908	0.4	5MR	20S	10MS	46	78	3.3	4.0	S
57.	PL911	1.6	10S	10MS	0	56	99	4.4	5.0	S
58.	PL912	37.3	80S	10MS	10MS	46	78	3.2	4.7	HS
59.	PL915	24.3	40S	40S	5MS	56	78	4.1	5.0	S
60.	PL916	36.4	60S	10MS	0	57	89	4.9	5.0	HS
61.	PL917	4.7	20MS	5MS	0	67	89	4.9	5.0	S
62.	PL918	26.6	60S	10S	0	67	89	4.8	5.0	S
63.	PL919	29.4	60S	5MS	0	57	78	5.0	5.0	HS
64.	PL920	26.6	60S	5S	0	56	89	4.4	5.0	S
65.	PL925	19.7	80S	5MS	10MS	68	89	5.0	5.0	S
66.	RD2994	5	20S	5S	10MS	67	89	4.4	5.0	S
67.	RD3011	21.9	60S	20S	0	67	89	4.5	4.7	S
68.	RD3012	14.3	40S	20S	0	57	89	4.8	5.0	S
69.	RD3013	8.9	20MS	10MS	0	68	99	4.4	5.0	S
70.	RD3014	51.4	80S	60S	5MS	57	89	5.0	5.0	HS
71.	RD3015	3.7	20S	0	0	68	99	4.7	5.0	S
72.	RD3016	3.3	10S	10S	0	88	99	4.8	5.0	S
73.	RD3017	14.7	40S	20MS	0	35	78	4.7	5.0	HS
74.	RD3018	35.7	80S	10MS	5MS	36	67	4.9	5.0	HS
75.	RD3019	11.6	60S	0	10S	67	99	4.6	5.0	S
76.	RD3020	8.5	40S	10S	0	57	78	5.0	5.0	S
77.	RD3021	3.4	20S	TMS	0	78	99	4.7	5.0	S
78.	RD3022	38	80S	10MS	0	56	78	3.7	4.7	S
79.	RD3023	6	20S	0	0	67	99	4.4	5.0	HS
80.	RD3024	2.7	10S	TMS	0	68	99	4.9	5.0	HS
81.	RD3025	18.6	60S	40S	0	57	89	4.9	5.0	S
82.	RD3026	4	20MS	10MS	10MS	46	89	4.2	5.0	S
83.	UPB1080	9.4	30S	20MS	10MS	67	89	4.6	5.0	S
84.	UPB1083	1.7	10S	10S	10MS	57	68	4.8	5.0	HS

85.	UPB1084	14.3	40S	5S	10S	46	68	4.3	5.0	S
86.	UPB1085	6.3	20S	40S	10MS	68	79	4.4	5.0	HS
87.	UPB1086	6.7	20S	5S	0	57	78	4.9	5.0	HS
88.	UPB1087	30	60S	5S	10S	57	78	4.4	5.0	S
89.	UPB1088	0.6	5MS	40S	10MS	67	89	4.9	5.0	S
90.	UPB1089	38.6	80S	20S	0	57	89	4.3	5.0	HS
91.	UPB1090	42.9	80S	40S	0	57	89	4.4	5.0	S
92.	VLB165	19.4	60S	5S	10MS	57	68	4.7	5.0	HS
93.	VLB166	1.5	10S	5MS	10S	68	79	4.3	5.0	S
94.	VLB167	24.3	60S	5MS	TMS	57	78	4.7	5.0	HS
95.	VLB168	1.8	10S	20MS	10MS	67	79	4.8	5.0	HS
96.	VLB169	7.1	20S	10S	10S	57	78	4.6	5.0	HS
97.	BH902 (C)	17.1	20S	20MS	10MS	68	99	4.4	5.0	S
98.	BH946 (C)	6.9	20MS	20S	0	57	99	4.7	5.0	HS
99.	BHS352(C)	9.4	40S	10MS	10S	68	89	4.3	5.0	HS
100.	BHS400(C)	17	40S	10S	0	46	68	5.0	5.0	HS
101.	DWRB101(C)	11.4	30S	10MS	10MS	57	99	4.3	4.7	S
102.	DWRB123 (C)	3	10MS	5S	5MS	56	89	4.7	5.0	S
103.	DWRB137(C)	6.3	30S	20S	0	68	99	4.4	5.0	S
104.	DWRB160 (C)	19.3	60S	20S	0	67	89	4.5	5.0	HS
105.	HBL113(C)	3.5	10S	40S	5MS	68	89	4.2	5.0	HS
106.	K 603 (C)	58.6	80S	10S	0	57	89	4.7	5.0	S
107.	Lakhan (C)	44	80S	5S	0	46	89	3.6	4.7	HS
108.	NDB1173(C)	40	60S	TS	5MS	46	78	4.7	5.0	S
109.	NDB943(C)	53.3	100S	TMS	0	46	69	4.9	5.0	S
110.	PL891(C)	22	60S	5S	0	46	78	4.3	4.7	S
111.	RD2552(C)	1.3	5S	TS	10S	57	78	4.6	4.9	S
112.	RD2794(C)	0.2	TS	20S	5MS	57	79	4.7	5.0	S
113.	RD2849 (C)	1.5	10MS	40S	10MS	57	89	4.7	5.0	HS
114.	RD2899(C)	3.7	10S	10MS	0	57	89	4.2	5.0	S
115.	RD2907(C)	1.6	10S	0	5MS	46	89	4.8	5.0	S
116.	VLB118(C)	5.7	20MS	5MS	0	57	79	4.8	5.0	HS
	Infector	88.6	100S	80S	10MS	89	99	5.0	5.0	HS

* Out of 129 entries, few check varieties and entries were found place in many trials and only one check is retained in NBDSN thus resulting 116 entries under NBDSN.

HS- Highest score, ACI- Average Coefficient of Infection; CCN- Cereal Cyst Nematode, HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R- Resistant, (c) *- Released Checks, ND- Not Determined, NG – Not germinated.*

Elite Barley Disease Screening Nursery (EBDSN, 2019-20)

The nursery was constituted with entries showed resistance to different disease in previous years in NBDSN and EBDSN. During the crop season 2018-19, total 44 entries were screened in EBDSN. The screening of stripe rust was done at Durgapura, Ludhiana, Hisar, Almora, Bajaura, Jammu and Karnal. Leaf rust screening was done at Ludhiana and Jammu. The leaf blight screening was done at Pantnagar, Varanasi, Kanpur and Faizabad. CCN screening was done at Hisar, Durgapura and Ludhiana centers.

Confirmed sources of resistance:

Out of 44 entries screened in EBDSN (Table 4), the following entries were confirmed for resistance against the particular disease under AICW&BIP. No entry found free from yellow rust, whereas 38 shown resistant reaction. Out of 44 entries screened for leaf blight, 6 entries also showed moderate level of resistance against leaf blight with an average score (double digit) 14-35 and HS < 57 but the HS was more due to one location. The center wise data is presented in Table 6. The resistant entries identified against yellow rust and blight are given below:

Yellow rust, ACI = 0, Entries – 0	**No entry found free from yellow rust**
Yellow rust, ACI > 0 to 10, Entries – 38	BH-1011, BH-1018, BH-1025, BK-1714, BK-1719, DWRB-101, DWRB-123, DWRB-137, DWRB-182, DWRB-184, DWRB-197, DWRB-198, HBL-113, HBL-845, HBL-848, HBL-851, HBL-858, HBL-863, PL-891, PL-906, PL-908, PL-909, PL-2899, PL-2980, PL-2981, PL-2994, PL-2999, PL-3000, PL-3002, PL-3003, PL-3004, PL-3005, PL-3007, PL-3008, PL-3010, UPB-1078 and VLB-130
Leaf blight, Avg. 13-35 with HS < 57*, Entries - 6	BH-1018, DWRB-182, BH-1011, BH-1025, DWRB-184 and DWRB-197

**HS has been more due to one location.*

Table 4: Reactions of different entries of barley in Elite Barley Disease Screening Nursery (EBDSN), 2019-20

SN	EBDSN Entries (2019- 20)	Yellow Rust		Leaf rust	Leaf Blight		CCN
		ACI	HS	HS	Avg.	HS	HS
1	BH-1011	3.9	10S	TMS	35	68	S
2	BH-1018	0.6	5MS	20S	24	58	S
3	BH-1025	2.9	5S	0	35	68	HS
4	BK-1714	5.9	40S	20S	78	89	S
5	BK-1719(LB)	6.3	20MS	10MS	46	78	HS
6	DWRB-101	2.7	10S	10S	46	68	HS
7	DWRB-123	3.6	20S	40S	46	58	HS
8	DWRB-137	1.3	10MS	20S	57	99	S
9	DWRB-137	0.6	5MS	TMS	57	99	S
10	DWRB-182	6.3	40S	20S	25	58	S
11	DWRB-184	1.2	10MS	5S	35	68	S
12	DWRB-197	2.2	10S	0	35	68	HS
13	DWRB-198	4.1	20MS	0	68	79	HS
14	HBL-113	0.9	5MS	20S	57	78	HS
15	HBL-845	1.4	10S	TMS	67	99	HS
16	HBL-848	0.1	TMR	TMS	57	78	HS
17	HBL-851	3.8	20MS	5S	57	68	S
18	HBL-858	1.5	10S	10MS	57	68	S
19	HBL-863	0.3	TMS	TS	56	76	HS
20	HUB-268(LB)	34.4	80S	40S	46	68	HS
20A	Infector	77.1	100S	60S	89	99	S
21	KB-1633	10.3	60S	TMS	57	79	S
22	KB-1750	14	40S	5S	67	78	S
23	KB-1757	12.6	40S	TR	46	68	S
24	PL-891	4.9	20S	0	36	58	HS
25	PL-906	1.8	10MS	5S	46	57	S
26	PL-908	0.6	5MS	5MS	46	68	S
27	PL-909	0.1	TMS	5MR	57	68	HS
28	PL-2899	3.6	20S	0	67	78	S
29	PL-2980	2.9	10S	0	68	78	S
30	PL-2981	1.2	5S	0	68	89	HS
31	PL-2994	1	5S	TR	47	68	S
32	PL-2999	0.7	5MS	10MS	78	99	S
33	PL-3000	1.8	10S	10S	78	99	S
34	PL-3002	0.1	TMR	5S	79	99	HS
35	PL-3003	3.6	20MS	5S	68	99	HS
36	PL-3004	1.7	10MS	0	68	78	S
37	PL-3005	0.2	TS	TS	47	68	HS
38	PL-3007	0.7	10MR	20S	36	58	HS
39	PL-3008(LB)	0.3	5MR	0	46	67	HS
40	PL-3009(LB)	18.3	40S	TS	57	68	S
40A	Infector	77.1	100S	60S	78	99	S
41	PL-3010	0.3	TS	40S	47	68	S
42	UPB-1078	2.1	10MS	TS	57	68	HS
43	VLB-130	1.7	5S	0	46	68	HS
44	VLB-164	11.9	40MS	TS	46	78	S

HS- Highest score, ACI- Average Coefficient of Infection; CCN- Cereal Cyst Nematode, HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R- Resistant, (c) *- Released Checks, ND- Not Determined, NG – Not germinated.*

Table 5: Center wise reactions of different entries of barley in National Barley Disease Screening Nursery (NBDSN), 2019-20

S. No.	Entry	Stripe rust							Leaf rust		Stem rust	Blight					Foliar aphis			CCN		
		Ludhiana	Durgapura	Bajaura	Karnal	Almora	Jammu	Hisar	Ludhiana	Jammu	Dharwad	Pantnagar	Kanpur	Faizabad	Varanasi	Dharwad	Ludhiana	Kanpur	Karnal	Ludhiana	Durgapura	Hisar
1.	ABI Kranti	10S	40MS	80S	40S	10S	20S	10S	5S	0	0	46	12	68	78	67	4.7	5.0	4.3	S	HS	NG
2.	BH1026	10MS	40MS	20S	20MS	0	40S	0	5MS	TMS	0	78	68	68	35	89	4.0	5.0	4.0	S	S	HS
3.	BH1027	20S	40S	20S	0	20S	40S	5S	0	TMS	10MS	35	57	58	26	89	4.7	5.0	5.0	S	S	S
4.	BH1028	40S	80S	30S	40S	5S	40S	30S	0	0	0	46	36	78	35	89	5.0	2.3	4.0	MR	S	S
5.	BH1029	5S	10MR	0	5MS	0	5MS	0	5S	0	5MS	36	79	78	46	89	4.3	5.0	4.0	S	S	MR
6.	BH1030	TS	TMR	15S	0	0	5MS	0	TS	20MS	0	67	24	68	36	99	5.0	4.7	4.3	S	S	S
7.	BH1031	10S	20S	30S	5MS	20S	40S	40S	5S	10MS	0	45	46	79	46	89	5.0	4.0	4.7	S	S	R
8.	BH1032	0	10MS	20S	5MR	0	5MS	0	5S	0	0	57	47	58	99	78	4.3	5.0	5.0	S	S	NG
9.	BH1033	0	10MR	15S	5MS	0	0	0	0	0	0	68	12	69	35	89	4.0	5.0	5.0	S	S	S
10.	BHS478	0	TMR	0	0	20S	40S	0	5S	TMS	5S	57	79	89	36	78	4.3	4.0	4.0	S	S	S
11.	BHS479	0	TMR	0	0	0	40S	0	0	TMS	0	79	68	89	99	89	4.3	5.0	5.0	S	HS	MR
12.	BHS480	20S	40S	30S	20MS	20S	10S	0	10S	20S	5MS	45	47	78	46	78	5.0	5.0	5.0	S	S	S
13.	BHS481	10MS	TMR	0	0	0	40S	0	0	0	5MS	46	87	79	36	89	4.3	5.0	4.0	S	S	HS
14.	BHS482	0	0	0	0	0	20S	0	0	TMS	10S	67	89	78	99	89	4.0	5.0	4.0	S	S	S
15.	DWRB182	TMR	5MR	0	0	0	0	20S	5S	20S	5MS	35	58	46	24	78	5.0	4.7	5.0	S	S	HS
16.	DWRB196	10S	40S	30S	20S	5S	20S	10S	5MS	5MS	5MS	68	68	89	68	89	4.0	5.0	4.0	S	S	S
17.	DWRB197	5MS	10MR	0	0	0	0	0	0	20MS	5MS	25	68	68	24	67	4.7	5.0	5.0	MR	S	S
18.	DWRB204	20S	60S	20S	40S	0	5MS	30S	10S	0	0	37	46	68	46	78	4.3	5.0	4.0	S	HS	S
19.	DWRB209	10S	60S	0	10MS	20S	10MS	20S	0	0	0	56	24	78	89	99	4.7	5.0	4.0	S	S	S
20.	DWRB210	TS	5MR	0	0	0	5MS	0	5S	20MS	0	57	46	58	36	99	4.7	5.0	5.0	S	S	NG
21.	DWRB211	5S	10S	0	0	0	TR	0	TS	0	0	34	68	78	35	89	4.0	5.0	4.3	S	HS	S
22.	DWRB212	20S	60S	20S	0	0	40S	0	TR	5MS	0	35	79	78	24	89	4.3	5.0	4.0	S	HS	S
23.	DWRB213	0	10MR	10S	80S	5S	0	80S	TS	0	0	35	12	78	46	78	4.7	5.0	4.0	S	S	S
24.	DWRB214	20S	60S	60S	30S	20S	40S	0	5S	TMS	0	89	36	89	68	99	4.3	5.0	5.0	S	S	S

S. No.	Entry	Stripe rust							Leaf rust		Stem rust	Blight					Foliar aphis			CCN		
		Ludhiana	Durgapura	Bajaura	Karnal	Almora	Jammu	Hisar	Ludhiana	Jammu	Dharwad	Pantnagar	Kanpur	Faizabad	Varanasi	Dharwad	Ludhiana	Kanpur	Karnal	Ludhiana	Durgapura	Hisar
25.	DWRB215	10S	80S	30S	30S	TS	40S	20S	0	0	5MS	67	36	89	36	99	4.7	5.0	4.3	S	S	NG
26.	DWRB216	TS	10MR	40S	60S	0	TR	60S	TS	5MR	10S	46	12	78	78	56	4.7	5.0	4.7	S	S	MR
27.	DWRB217	10S	5MR	0	5MS	NG	10MS	0	5MS	TMS	10S	57	12	78	46	78	4.3	5.0	4.3	S	S	S
28.	HBL864	40S	40S	0	40S	0	10S	10S	5S	0	0	57	89	68	36	46	4.7	5.0	5.0	S	HS	S
29.	HBL865	0	0	0	0	0	20S	0	0	20S	10MS	99	79	78	NG	67	4.3	5.0	5.0	S	S	HS
30.	HBL866	5S	10S	20S	5MR	10S	0	0	0	0	5S	89	79	68	36	78	4.0	5.0	4.0	S	S	HS
31.	HBL867	10S	20S	10S	10MS	20S	40S	0	TS	5MS	5S	89	68	69	36	67	4.0	2.0	4.3	S	S	S
32.	HBL868	TMS	5MS	0	0	0	60S	0	0	10S	10S	37	68	78	26	78	4.3	5.0	4.3	S	S	S
33.	HUB270	10MS	40MS	30S	20S	0	5MS	30S	0	0	0	46	24	58	46	78	4.7	5.0	4.0	S	S	S
34.	HUB271	0	40MS	0	10MS	TS	5MS	10S	5MS	20S	0	36	24	78	57	89	4.7	5.0	4.7	S	S	S
35.	HUB272	0	5MR	0	10MS	0	10S	0	TR	TMS	0	34	24	68	46	89	4.7	5.0	4.3	S	S	S
36.	HUB273	40S	80S	60S	40S	20S	60S	0	0	0	0	35	36	46	57	56	4.7	5.0	5.0	S	S	S
37.	HUB274	40S	60S	60S	40S	40S	5MS	0	10S	20MR	0	46	24	46	24	78	4.3	5.0	5.0	S	S	HS
38.	HUB69	0	TMR	0	0	0	TR	0	5S	20S	10MS	57	79	78	35	78	4.3	4.3	4.0	S	S	S
39.	K1149	80S	80S	15S	40S	NG	60S	40S	5MS	20S	10MS	56	12	68	35	78	4.7	5.0	4.7	S	S	S
40.	Karan16	40S	60S	20S	5MS	10S	40S	0	0	40S	10MS	57	24	68	89	78	4.3	5.0	4.3	S	S	S
41.	KB1707	0	TR	0	10MS	0	0	0	TS	20S	10MS	57	89	78	46	78	4.7	5.0	4.0	S	S	S
42.	KB1815	20S	60S	60S	40S	TS	40S	0	0	20MS	0	47	48	68	68	46	4.5	5.0	4.5	S	S	HS
43.	KB1816	20S	60S	60S	40S	5S	40S	40S	5MS	TMS	0	89	68	68	35	89	4.3	5.0	5.0	S	S	S
44.	KB1817	TS	TMR	30S	0	0	10S	0	0	0	0	35	36	68	36	89	4.0	4.3	4.0	S	S	MR
45.	KB1822	TMS	5MR	0	0	0	40S	0	5MS	TMS	10MS	68	57	46	99	99	4.3	5.0	5.0	S	S	MR
46.	KB1830	5S	TMR	20S	10MS	0	0	0	0	0	0	34	24	68	35	78	4.3	5.0	4.0	S	S	HS
47.	KB1832	40S	40S	20S	40S	5S	40S	0	TS	0	20S	47	24	68	35	89	5.0	5.0	5.0	S	S	S
48.	KB1843	5S	20MS	30S	10MS	0	TMS	0	0	0	10MS	45	46	58	78	89	4.3	5.0	4.0	S	HS	NR
49.	KB1845	5S	20S	20S	0	0	60S	20S	0	20S	5MS	47	36	46	24	56	4.7	5.0	5.0	S	S	HS

S. No.	Entry	Stripe rust							Leaf rust		Stem rust	Blight					Foliar aphis			CCN		
		Ludhiana	Durgapura	Bajaura	Karnal	Almora	Jammu	Hisar	Ludhiana	Jammu	Dharwad	Pantnagar	Kanpur	Faizabad	Varanasi	Dharwad	Ludhiana	Kanpur	Karnal	Ludhiana	Durgapura	Hisar
50.	KB1848	20S	60S	80S	80S	10S	40S	60S	0	10MS	5MS	35	36	58	35	67	5.0	5.0	5.0	S	S	HS
51.	NDB1730	10S	20S	60S	5MS	5S	40S	0	0	TMS	10S	57	46	68	1	78	4.7	5.0	5.0	S	S	S
52.	NDB1738	20S	40S	40S	30S	20S	60S	20S	5S	10MS	0	36	79	68	24	89	4.7	4.7	4.0	S	S	NG
53.	NDB1742	TS	5MR	40S	5MS	0	10MS	5S	0	0	10MS	35	68	78	24	78	4.3	5.0	5.0	S	S	S
54.	NDB1748	0	10MR	20S	0	NG	10S	0	10MS	0	0	47	24	58	24	67	4.0	5.0	4.0	S	HS	S
55.	PL906	0	10MR	0	5MS	10S	5MS	10S	TR	20S	10MS	35	79	58	24	78	3.7	5.0	4.0	S	S	MR
56.	PL908	TS	5MR	0	0	0	0	0	0	20S	10MS	24	46	68	24	78	4.0	2.0	4.0	S	S	HS
57.	PL911	0	TMR	0	0	10S	TMS	0	TS	10MS	0	45	24	78	46	99	4.3	5.0	4.0	S	S	S
58.	PL912	20S	80S	60S	20S	TS	40S	40S	10MS	5MR	10MS	35	24	47	35	78	4.7	2.0	3.0	S	S	S
59.	PL915	20S	40S	40S	40S	0	TR	30S	5S	40S	5MS	35	46	68	35	78	4.0	3.3	5.0	S	S	HS
60.	PL916	5S	60S	40S	40S	40S	40S	30S	0	10MS	0	35	68	78	26	89	4.7	5.0	5.0	S	HS	S
61.	PL917	0	10MR	5MR	0	TS	20MS	10S	0	5MS	0	35	79	79	35	89	4.7	5.0	5.0	S	S	NG
62.	PL918	10S	40S	60S	20MS	0	40S	20S	10S	0	0	36	24	78	89	89	4.3	5.0	5.0	S	S	NR
63.	PL919	10S	20MS	40S	60S	40S	40S	0	TS	5MS	0	35	24	78	68	78	5.0	5.0	5.0	S	S	HS
64.	PL920	20S	60S	30S	20MS	10S	40S	10S	5S	TMS	0	34	36	68	35	89	4.3	5.0	4.0	S	S	S
65.	PL925	0	80S	20S	10MS	NG	TR	10S	TS	5MS	10MS	35	68	78	89	78	5.0	5.0	5.0	S	S	S
66.	RD2994	0	5R	0	0	0	20S	10S	5S	0	10MS	57	57	78	36	89	4.3	5.0	4.0	S	S	HS
67.	RD3011	20S	40S	20S	10MS	5S	60S	0	0	20S	0	45	68	78	35	89	4.7	4.7	4.3	S	S	HS
68.	RD3012	0	20S	20S	0	0	40S	20S	10S	20S	0	57	46	68	35	89	4.7	5.0	4.7	S	S	S
69.	RD3013	5S	20MS	0	20MS	5S	10S	10S	0	10MS	0	46	99	58	36	99	4.3	5.0	4.0	S	S	S
70.	RD3014	20S	80S	60S	60S	40S	60S	40S	TS	60S	5MS	67	36	78	35	89	5.0	5.0	5.0	S	MR	HS
71.	RD3015	0	5MR	0	0	0	5MS	20S	0	0	0	89	36	69	99	67	4.0	5.0	5.0	S	S	HS
72.	RD3016	5S	20MR	0	0	0	10S	0	10S	TMR	0	99	68	78	99	78	4.3	5.0	5.0	S	S	S
73.	RD3017	10S	20S	40S	20S	5S	10MS	0	0	20MS	0	34	24	35	24	78	4.0	5.0	5.0	S	S	S
74.	RD3018	20S	80S	60S	20S	20S	40S	10S	10MS	0	5MS	35	12	58	26	67	4.7	5.0	5.0	S	S	S

S. No.	Entry	Stripe rust							Leaf rust		Stem rust	Blight					Foliar aphis			CCN		
		Ludhiana	Durgapura	Bajaura	Karnal	Almora	Jammu	Hisar	Ludhiana	Jammu	Dharwad	Pantnagar	Kanpur	Faizabad	Varanasi	Dharwad	Ludhiana	Kanpur	Karnal	Ludhiana	Durgapura	Hisar
75.	RD3019	10S	5MR	0	0	5S	5MS	60S	0	0	10S	57	36	68	99	67	4.7	5.0	4.0	MR	S	S
76.	RD3020	40S	10MR	10S	TR	5S	0	0	10S	0	0	57	36	78	24	78	5.0	5.0	5.0	MR	HS	S
77.	RD3021	0	0	0	0	0	5MS	20S	TMS	TMS	0	56	68	78	99	78	4.3	5.0	4.7	S	S	HS
78.	RD3022	10S	40S	30S	80S	NG	10MS	60S	0	10MS	0	67	24	68	35	78	4.7	2.0	4.3	S	HS	HS
79.	RD3023	10S	20S	0	10MS	0	5MS	0	0	0	0	35	46	68	68	99	4.3	5.0	4.0	S	S	S
80.	RD3024	TS	10MS	0	0	0	10S	0	0	TMS	0	67	46	69	68	99	4.7	5.0	5.0	S	R	HS
81.	RD3025	10S	60S	0	0	0	20S	40S	5S	40S	0	34	68	78	35	89	4.7	5.0	5.0	S	HS	NG
82.	RD3026	10MS	20MS	0	0	0	5MS	0	10MS	5MS	10MS	35	36	47	35	89	5.0	3.0	4.7	S	S	HS
83.	UPB1080	5MS	20MS	30S	10S	TS	5S	0	0	20MS	10MS	46	89	78	46	78	4.7	5.0	4.0	S	S	HS
84.	UPB1083	0	TMR	0	TMR	0	TMS	10S	10S	0	10MS	46	68	68	35	67	4.3	5.0	5.0	MR	S	HS
85.	UPB1084	10S	40S	20S	20S	10S	0	0	5S	0	10S	36	68	46	36	46	4.0	5.0	4.0	S	S	S
86.	UPB1085	0	20MS	20S	5MS	0	5MS	0	0	40S	10MS	79	79	68	24	78	4.3	5.0	4.0	S	HS	S
87.	UPB1086	10S	20S	0	20MS	0	TMS	0	5S	TMS	0	67	24	58	46	78	5.0	5.0	4.7	S	S	MR
88.	UPB1087	20S	60S	30S	20S	10S	40S	30S	5S	0	10S	45	47	58	36	78	4.3	5.0	4.0	S	MR	S
89.	UPB1088	0	TMR	0	0	0	5MS	0	0	40S	10MS	56	68	78	24	89	4.7	5.0	5.0	S	S	S
90.	UPB1089	20S	80S	40S	60S	10S	40S	20S	10S	20S	0	35	36	68	35	89	4.0	5.0	4.0	MR	S	HS
91.	UPB1090	20S	80S	60S	80S	0	60S	0	0	40S	0	35	68	58	35	89	4.3	5.0	4.0	S	S	S
92.	VLB165	10S	20MS	30S	0	20S	60S	0	5S	0	10MS	46	68	68	26	67	4.3	5.0	4.7	S	S	HS
93.	VLB166	0	10S	0	0	0	TMS	0	5MS	0	10S	58	79	68	35	78	4.0	5.0	4.0	S	S	MR
94.	VLB167	20S	60S	40S	20S	10S	20S	0	5MS	TMS	TMS	46	57	78	36	67	4.0	5.0	5.0	S	S	S
95.	VLB168	TMS	5MR	0	0	0	10S	0	TS	20MS	10MS	78	79	68	24	78	4.3	5.0	5.0	S	S	HS
96.	VLB169	10S	20S	15S	5MS	0	TMS	0	10S	0	10S	78	68	78	35	46	4.7	5.0	4.0	S	S	S
97.	BH902 (C)	20S	20S	30S	10S	20S	20S	0	10S	20MS	10MS	46	79	78	36	99	4.4	4.4	4.3	S	S	S
98.	BH946 (C)	0	10MR	10S	10MS	0	20MS	10S	0	20S	0	46	24	68	68	99	4.5	5.0	4.5	S	S	HS
99.	BHS352(C)	0	20MS	0	0	10S	40S	0	5S	10MS	10S	47	89	78	68	78	4.0	5.0	4.0	S	HS	NR

S. No.	Entry	Stripe rust							Leaf rust		Stem rust	Blight					Foliar aphis			CCN		
		Ludhiana	Durgapura	Bajaura	Karnal	Almora	Jammu	Hisar	Ludhiana	Jammu	Dharwad	Pantnagar	Kanpur	Faizabad	Varanasi	Dharwad	Ludhiana	Kanpur	Karnal	Ludhiana	Durgapura	Hisar
100.	BHS400(C)	20S	40S	30S	10MS	5S	20MS	0	10S	5MS	0	45	68	35	25	56	5.0	5.0	5.0	S	S	HS
101.	DWRB101(C)	10S	10S	10S	0	20S	0	30S	0	10MS	10MS	68	36	68	35	99	4.3	4.7	4.0	S	S	S
102.	DWRB123 (C)	5MS	10MS	0	5MS	0	0	5S	5S	TMS	5MS	78	12	47	35	89	4.5	5.0	4.5	S	S	S
103.	DWRB137(C)	5S	TMR	0	0	TS	10MS	30S	10S	20S	0	45	68	89	48	99	4.2	5.0	4.0	S	S	S
104.	DWRB160 (C)	20S	60S	30 S	20S	0	20MS	0	0	20S	0	46	58	78	68	99	4.2	5.0	4.4	S	S	MR
105.	HBL113(C)	10S	TMR	0	5MS	0	10S	0	0	40S	5MS	67	89	68	46	78	3.7	5.0	4.0	S	S	S
106.	K 603 (C)	60S	80S	80S	60S	40S	60S	30S	0	10S	0	35	24	79	78	89	4.7	5.0	4.3	S	S	MR
107.	Lakhan (C)	20S	40S	80S	10MS	40S	60S	60S	5S	5MS	0	35	12	78	35	89	4.7	2.0	4.0	S	S	S
108.	NDB1173(C)	20S	60S	60S	60S	40S	40S	0	TS	TMR	5MS	45	36	78	24	67	4.0	5.0	5.0	S	S	S
109.	NDB943(C)	80S	100S	80S	0	NG	60S	0	0	TMS	0	36	12	69	46	67	4.7	5.0	5.0	S	S	S
110.	PL891(C)	0	10MR	30S	60S	0	0	60S	5S	0	0	46	24	58	35	78	4.7	3.7	4.7	S	S	S
111.	RD2552(C)	0	0	0	0	5S	5MS	0	TS	0	10S	47	46	69	35	78	4.4	4.9	4.3	S	S	S
112.	RD2794(C)	0	TMR	0	0	TS	0	0	5S	20S	5MS	67	36	79	24	78	4.0	5.0	5.0	S	S	S
113.	RD2849 (C)	TMS	10MS	0	5MR	0	0	0	5S	40S	10MS	57	24	68	35	89	4.5	5.0	4.5	S	S	HS
114.	RD2899(C)	TMS	TMR	0	5MS	10S	TMS	10S	TS	10MS	0	45	36	78	35	89	3.7	5.0	4.0	S	S	S
115.	RD2907(C)	0	TMR	0	TMS	0	10S	0	0	0	5MS	46	36	46	35	89	4.3	5.0	5.0	S	S	HS
116.	VLB118(C)	0	20MS	15S	0	TS	10MS	0	5MS	0	0	36	79	78	24	67	4.3	5.0	5.0	S	HS	S
	Infector	60S	100S	100S	100S	80S	80S	100S	60S	80S	10MS	78	78	89	99	99	5.0	5.0	5.0	HS	S	S

* Out of 129 entries, few check varieties were found place in many trials and only one check is retained in NBDSN thus resulting 116 entries under NBDSN.

HS- Highest score, ACI- Average Coefficient of Infection; CCN- Cereal Cyst Nematode, HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R- Resistant, (c) - *Released Checks, ND- Not Determined, NG – Not germinated.*

Table 6: Center wise reactions of different entries of barley in Elite Barley Disease Screening Nursery (EBDSN), 2019-20

S. No.	Entry	Stripe rust							Leaf rust		Foliar blight				CCN		
		Ludhiana	Durgapura	Bajaura	Karnal	Almora	Jammu	Hisar	Ludhiana	Jammu	Pantnagar	Kanpur	Faizabad	Varanasi	Ludhiana	Durgapura	Hisar
1	BH-1011	5S	10MS	0	5MS	0	TMR	10S	0	TMS	46	24	68	12	S	S	MR
2	BH-1018	0	5MS	0	0	0	TMR	0	20S	0	37	0	58	12	S	S	S
3	BH-1025	5S	10MR	5S	5S	TS	0	0	0	0	35	24	68	12	S	S	HS
4	BK-1714	TMS	TR	0	0	0	40S	0	10MS	20S	67	68	89	78	S	S	MR
5	BK-1719(LB)	5MR	20MR	0	10MS	0	20MS	10S	10MS	5MS	46	24	78	35	S	HS	NG
6	DWRB-101	0	10S	5S	0	0	5MS	0	10S	10MS	56	24	68	46	S	S	HS
7	DWRB-123	0	5MS	0	0	TS	20S	0	40S	0	57	2	58	46	S	S	HS
8	DWRB-137	TS	TMR	0	0	0	10MS	0	20S	5S	35	24	78	99	S	S	S
9	DWRB-137	0	0	0	0	0	5MS	0	TMR	TMS	24	36	69	99	S	S	S
10	DWRB-182	0	10MR	0	0	0	40S	0	20S	10MS	25	2	58	24	MR	S	S
11	DWRB-184	0	TMR	0	TR	0	10MS	0	0	5S	26	0	68	24	S	S	S
12	DWRB-197	5MS	TMR	0	TMR	0	TMR	10S	0	0	46	0	68	24	MR	S	HS
13	DWRB-198	0	20MS	5S	5MS	0	5MS	0	0	0	25	79	78	68	S	MR	HS
14	HBL-113	0	0	0	5MR	0	5MS	0	20S	0	45	68	78	35	S	S	HS
15	HBL-845	0	0	0	0	0	10S	0	0	TMS	24	47	78	99	S	HS	S
16	HBL-848	0	0	0	0	0	TMR	0	0	TMS	36	57	68	78	S	S	HS
17	HBL-851	10MS	20MS	0	5MR	0	TMR	0	0	5S	67	68	47	24	S	S	S
18	HBL-858	0	TMR	0	0	0	10S	0	0	10MS	46	68	58	35	S	S	S
19	HBL-863	0	0	0	0	0	TMS	TS	TS	0	35	76	68	46	S	S	HS
20	HUB-268(LB)	20S	40S	80S	40S	20S	40S	TS	40S	0	67	46	68	1	S	S	HS
20A	Infector	60S	100S	80S	80S	60S	80S	80S	60S	60S	68	78	89	99	S	NR	NR
21	KB-1633	0	20MR	60S	5MS	0	TR	0	0	TMS	45	79	69	24	S	S	NR

S. No.	Entry	Stripe rust							Leaf rust		Foliar blight				CCN		
		Ludhiana	Durgapura	Bajaura	Karnal	Almora	Jammu	Hisar	Ludhiana	Jammu	Pantnagar	Kanpur	Faizabad	Varanasi	Ludhiana	Durgapura	Hisar
22	KB-1750	10S	40S	40S	5MS	0	5MS	0	5S	0	67	57	78	46	S	S	S
23	KB-1757	10S	20S	40S	10MS	0	10S	0	TR	0	25	24	68	46	S	S	MR
24	PL-891	5MS	10MR	20S	5MR	0	5MS	0	0	0	35	24	58	25	S	HS	S
25	PL-906	0	TMR	0	10MS	0	5MS	0	5S	TMS	45	57	46	35	S	S	S
26	PL-908	0	0	0	0	0	5MS	0	0	5MS	35	68	46	35	S	S	S
27	PL-909	0	0	0	0	0	TMS	0	0	5MR	57	68	68	35	S	HS	S
28	PL-2899	0	0	0	0	TS	5MS	20S	0	0	35	58	78	78	S	MR	NG
29	PL-2980	0	0	0	0	0	10S	10S	0	0	57	68	78	68	S	S	S
30	PL-2981	TS	5MR	0	0	0	TMR	5S	0	0	35	68	89	78	S	S	HS
31	PL-2994	0	5MR	0	0	0	0	5S	TR	0	24	46	58	68	S	S	S
32	PL-2999	0	0	0	0	0	5MS	TS	0	10MS	57	57	78	99	S	S	S
33	PL-3000	0	0	0	TMS	TS	10S	TS	0	10S	68	68	78	99	S	S	MR
34	PL-3002	0	TMR	0	0	0	0	0	5S	5S	79	68	78	99	S	HS	S
35	PL-3003	5MS	20MS	0	0	0	5S	0	5S	TMS	36	58	78	99	S	HS	S
36	PL-3004	0	10MR	0	0	0	10MS	0	0	0	57	58	78	78	S	S	S
37	PL-3005	TS	TMR	0	0	0	TR	0	TS	0	35	58	68	25	S	S	HS
38	PL-3007	0	10MR	0	TMR	0	TR	0	20S	0	24	36	58	36	S	HS	S
39	PL-3008(LB)	0	5MR	0	0	0	TR	0	0	0	67	24	46	25	S	HS	S
40	PL-3009(LB)	20S	40S	30S	10MS	0	20S	10S	TS	0	45	47	58	68	S	S	S
40A	Infector	60S	100S	100S	80S	40S	80S	80S	60S	60S	47	68	89	99	S	NR	NR
41	PL-3010	TS	0	0	0	0	TMR	TS	40S	0	68	24	58	46	S	S	S
42	UPB-1078	TS	5MR	0	10MS	0	5MS	0	TS	0	35	36	68	68	S	HS	S
43	VLB-130	5MR	10MR	0	TMS	0	0	5S	0	0	35	24	68	46	MR	HS	S
44	VLB-164	20MS	40MS	15S	20S	0	0	0	TS	5MR	47	36	78	24	S	S	S

HS- Highest score, ACI- Average Coefficient of Infection; CCN- Cereal Cyst Nematode, HS- Highly susceptible, S- Susceptible, MR- Moderately Resistant, R- Resistant, (c) *- Released Checks, ND- Not Determined, NG – Not germinated*

Evaluation for seedling rust resistance against three rusts of barley

All entries of NBDSN and EBDSN were screened against the different pathotypes of three rusts of barley under precise conditions of temperature and light. Wherever, needed confirmatory and selected testing was also undertaken. These lines were evaluated against five pathotypes of *P. graminis tritici (Pgt)*, seven pathotypes of *P. striiformis hordei (Psh)* and 4 pts as well as mixture of pts. of *P. hordei (Ph)*. None of the NBDSN and EBDSN entries was resistant to all the tested pathotypes of *Pst*, *Ph* and *Pgt*. The detailed report is presented below.

Rust resistance in NBDSN lines

A total 116 lines of NBDSN were evaluated against the different pathotypes of *Puccinia* spp on barley. None of the lines was resistant to all the rusts of barley. Twelve lines were resistant both to leaf and stripe rusts, one to stem and stripe rusts whereas 4 to leaf and stem rusts. In addition, 16 lines were resistant to stripe, 2 to stem and 22 to leaf rust only (Table 7). The responses of each entry against different pathotypes of rust have been given in Table 9.

Table 7: Seedling rust resistance in NBDSN lines during 2019-20

Resistant to	Number of entries	Detail of entries
Leaf and stripe	12	BHS478, BHS481, BHS482, HBL865, HBL867, HBL868, PL908, RD3015, RD3016, RD3019, RD3021, HBL113(C)
Stem and stripe	1	DWRB182
Leaf and stem	4	DWRB197, KB1848, PL925, VLB169
Stripe	16	BH1030, DWRB213, HUB69, KB1817, KB1822, KB1830, PL906, PL911, RD2994, UPB1083, UPB1088, DWRB137(C), RD2552(C), RD2794(C), RD2899(C), RD2907(C)
Stem	2	DWRB212, PL915
leaf	22	BHS479, BHS480, DWRB204, DWRB209, HUB273, KB1843, NDB1738, PL916, PL918, PL919, PL920, RD3011, RD3013, RD3022, UPB1080, UPB1085, UPB1086, VLB165, VLB166, VLB168, BHS400(C), VLB118(C)

Rust resistance in EBDSN lines

Forty-four lines were evaluated for resistance to three rusts by using all the virulent and predominant pathotype of each. Resistance to all the rusts was not found in any line. However, 9 lines were resistant to leaf and stripe rusts, 1 to stem and stripe rusts, 2 to leaf and stem rusts. Resistance to individual rust was observed in 19 lines. Of these 10 lines showed resistance to stripe, one to stem and 8 to leaf rust only (Table 8). The responses of each entry against different pathotypes of rust have been given in Table 10.

Table 8: Seedling rust resistance in EBDSN lines

Resistant to	Number of entries	Detail of entries
Leaf and stripe	9	HBL113, HBL845, HBL863, PL908, PL2999, PL3000, PL3002, PL3003, PL3004
Stem and stripe	1	DWRB182
Leaf and stem	2	DWRB197, UPB1078
Stripe	10	BK1714, DWRB137, HBL848, PL906, PL909, PL2899, PL2980, PL2981, PL2994, PL3005
Stem	1	PL3010
leaf	8	BK1719(LB), DWRB184, HBL851, KB1633, KB1757, PL3009(LB), VLB130, VLB164

Table 9: Seedling response of NBDSN lines to the pathotypes of three rust pathogens of barley during 2019-20

S. No.	Line/Variety	Pathotypes																
		Leaf rust					Stem rust					Stripe rust						
		H1	H2	H4	H5	Mix	11	21A-2	40A	117-6	122	57	24	M	G	Q	6S0	7S0
1.	ABI Kranti	R	MR	S	R	S	R	S	MR	R	MR	S	S	S	R	S	S	S
2.	BH1026	S	MS	MS	MS	S	MR	MS	MS	R	MR	S	S	S	S	S	S	S
3.	BH1027	S	MS	MS	MR	S	S	MR	MR	R	R	S	S	S	S	S	S	S
4.	BH1028	MS	R	MS	S	S	R	MS	MR	MS	R	S	S	S	S	S	S	S
5.	BH1029	MR	R	R	MS	MS	S	S	S	MS	R	R	R	R	R	MS	R	R
6.	BH1030	MS	R	MR	R	MS	MR	MR	R	MR	R	R	R	R	R	R	R	R
7.	BH1031	MS	MS	MR	MS	MS	R	MS	MR	R	R	MS	S	S	R	S	S	S
8.	BH1032	MR	R	R	R	MR	MS	R	R	R	MS	S	MS	MS	S	MS	S	S
9.	BH1033	S	S	S	S	S	S	MR	S	S	MR	MS	MS	S	MX	S	S	MS
10.	BHS478	R	R	R	R	R	MS	R	MR	MR	MR	R	R	R	R	R	R	R
11.	BHS479	R	R	R	R	R	NG	S	S	R	R	R	MR	R	R	R	R	R
12.	BHS480	R	R	R	R	R	S	R	R	R	R	S	S	MS	R	S	MX	S
13.	BHS481	R	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R
14.	BHS482	R	R	R	R	R	MS	R	R	R	R	R	R	R	R	R	R	R
15.	DWRB182	MS	MS	R	R	MS	R	R	R	R	R	R	R	R	R	R	R	R
16.	DWRB196	MR	R	R	R	R	MR	R	S	MR	R	MR	S	S	S	MS	R	S
17.	DWRB197	R	R	R	R	R	R	R	R	R	R	S	S	S	S	S	S	S
18.	DWRB204	R	R	R	R	R	R	R	MR	R	R	S	MS	MS	R	MS	MR	MS
19.	DWRB209	R	R	R	R	R	R	R	R	R	MR	S	S	S	MS	S	S	MS
20.	DWRB210	S	S	R	S	S	R	R	S	R	R	S	R	R	R	R	R	R
21.	DWRB211	MS	NG	R	MR	MS	S	R	R	R	MR	S	S	S	S	S	S	S
22.	DWRB212	MS	R	R	S	S	R	R	R	R	R	S	S	S	R	S	S	S
23.	DWRB213	S	S	MR	R	S	MR	S	MS	MR	MS	R	R	R	R	R	R	R
24.	DWRB214	S	MS	MS	S	S	S	R	MS	MR	R	S	S	S	S	S	S	S
25.	DWRB215	S	R	MR	MR	S	MR	MS	MR	MR	R	S	S	S	S	S	S	S
26.	DWRB216	R	R	R	NG	R	MR	R	S	R	R	R	R	MS	R	MS	S	S
27.	DWRB217	MS	R	R	R	MS	MR	S	MR	R	R	S	MS	R	R	R	R	R
28.	HBL864	MS	MS	R	S	S	MS	R	S	R	R	R	MX	MX	R	R	R	R
29.	HBL865	R	R	R	R	R	S	R	R	MR	R	R	R	R	R	R	R	R
30.	HBL866	R	S	R	R	S	MS	R	R	R	R	R	S	S	R	MS	R	MS
31.	HBL867	R	R	R	R	R	R	R	MR	R	R	R	R	R	R	R	R	R
32.	HBL868	R	R	R	R	R	MS	R	R	MS	R	R	R	R	R	R	R	R

33.	HUB270	S	S	S	S	S	MR	S	S	R	S	MS	S	S	MS	MS	S	S
34.	HUB271	MS	R	R	S	S	MR	MS	S	R	R	R	S	S	S	S	S	S
35.	HUB272	NG	R	MR	R	MR	MR	MR	R	MS	R	R	R	S	R	R	S	R
36.	HUB273	R	R	R	R	R	R	R	MS	R	MR	S	S	S	S	S	MS	MS
37.	HUB274	MS	S	MS	S	S	S	S	S	S	R	MS	S	S	MS	S	S	S
38.	HUB69	S	MS	MR	MS	S	R	MR	MR	R	MR	R	R	R	R	R	R	R
39.	K1149	S	MR	R	MS	S	R	MR	R	R	R	S	S	S	MS	S	R	R
40.	Karan16	R	MS	R	S	S	S	MS	S	MR	MR	S	S	S	MS	S	S	S
41.	KB1707	S	MS	MR	S	S	MS	MR	MR	R	R	R	S	R	S	R	R	R
42.	KB1815	MR	MS	R	MR	MS	MR	R	S	MR	R	MS	S	S	S	S	S	S
43.	KB1816	S	S	R	S	S	MS	S	R	S	S	S	S	S	S	S	S	S
44.	KB1817	MS	S	S	MS	S	R	S	S	R	R	R	R	R	R	R	R	R
45.	KB1822	S	MS	MS	S	S	S	S	MR	MS	S	R	R	R	R	R	R	R
46.	KB1830	S	R	MS	S	S	R	R	S	MS	MR	R	R	R	R	R	R	R
47.	KB1832	R	R	R	MR	MR	S	S	R	MR	R	MS	S	S	S	S	S	MS
48.	KB1843	R	R	R	R	R	MR	R	MS	MS	R	S	S	S	S	S	R	S
49.	KB1845	R	S	R	MR	S	R	R	MR	MR	MR	S	MS	S	S	S	S	S
50.	KB1848	R	R	R	R	R	R	R	R	R	R	MS	R	S	MS	S	R	R
51.	NDB1730	MS	R	R	S	S	S	R	MR	R	R	S	S	S	S	S	S	S
52.	NDB1738	R	R	R	R	R	MR	MS	S	MR	MS	S	S	S	S	S	S	S
53.	NDB1742	MR	R	R	S	S	MR	MS	MR	MS	R	S	S	S	S	S	S	S
54.	NDB1748	R	S	R	R	S	MS	R	MS	R	R	R	MX	S	S	MS	MS	S
55.	PL906	MR	S	R	S	R	MS	MS	S	S	R	R	R	R	R	R	R	R
56.	PL908	R	R	R	R	R	MR	R	MR	MS	R	R	R	R	R	R	R	R
57.	PL911	S	MR	MR	MS	S	MR	S	S	MS	R	R	R	R	R	R	R	R
58.	PL912	S	R	R	MR	S	MR	S	S	R	MR	MS	S	S	MS	S	S	S
59.	PL915	MR	R	R	MS	MS	R	R	R	R	R	R	S	S	S	R	S	S
60.	PL916	R	R	R	R	R	R	MR	S	R	R	R	R	S	MS	S	S	R
61.	PL917	S	S	MS	S	S	MR	S	S	MR	S	MS	S	MS	MS	MS	R	R
62.	PL918	R	R	R	R	R	R	MR	R	R	R	MS	MS	MS	R	MS	MS	R
63.	PL919	R	R	R	R	R	MS	MS	MR	R	R	MS	MS	S	R	MS	S	S
64.	PL920	R	R	R	R	R	S	S	R	R	R	S	S	S	MS	MS	R	R
65.	PL925	R	R	R	R	R	R	R	R	R	R	S	S	S	S	MS	S	MS
66.	RD2994	R	R	R	MS	R	S	MS	MR	R	R	R	R	R	R	R	R	R
67.	RD3011	R	R	R	R	R	MS	R	R	MR	MR	R	S	S	R	R	R	R
68.	RD3012	S	S	MS	S	S	MR	S	S	MR	R	MS	S	S	MX	S	S	MS

69.	RD3013	R	R	R	R	R	MR	MS	S	S	S	S	S	S	S	S	S	S
70.	RD3014	S	R	R	S	S	S	MS	S	MS	MS	S	S	S	S	S	S	S
71.	RD3015	R	R	R	R	R	R	R	MS	R	MS	R	R	R	R	R	R	R
72.	RD3016	R	R	R	R	R	MR	R	R	R	S	R	R	R	R	R	R	R
73.	RD3017	R	R	R	S	S	S	S	S	MR	MS	S	S	S	S	S	S	S
74.	RD3018	MR	R	R	R	MR	S	MR	R	MR	MR	S	S	S	S	S	S	S
75.	RD3019	R	R	R	R	R	MR	R	S	MR	R	R	R	R	R	R	R	R
76.	RD3020	MS	MR	R	S	S	MS	MS	R	S	R	R	R	R	S	R	MX	R
77.	RD3021	R	R	R	R	R	S	S	R	R	R	R	R	R	R	R	R	R
78.	RD3022	R	R	R	R	R	R	R	MS	R	MR	R	R	S	R	S	MS	S
79.	RD3023	S	MR	R	S	S	MR	R	MS	R	R	S	S	S	S	S	S	S
80.	RD3024	S	MR	MR	S	S	MR	R	MR	R	R	S	S	S	S	S	S	S
81.	RD3025	S	S	R	MR	S	MR	R	S	R	MR	S	S	S	S	S	MS	S
82.	RD3026	MR	MR	R	R	MR	S	R	MR	MR	MR	MS	S	S	MS	S	S	S
83.	UPB1080	R	R	R	R	R	S	MS	S	MS	R	S	S	S	S	S	S	S
84.	UPB1083	MS	MS	MS	MS	MS	S	S	S	MR	R	R	R	R	R	R	R	R
85.	UPB1084	MS	R	NG	R	MS	MR	MS	MR	MS	R	S	S	S	MS	S	S	S
86.	UPB1085	R	R	R	R	R	R	MS	MS	MS	R	MS	S	S	S	MS	S	S
87.	UPB1086	R	R	R	R	R	R	R	MS	R	R	R	S	MR	R	MS	MS	R
88.	UPB1087	MR	MR	R	R	MR	S	MR	MR	S	R	S	S	S	S	S	S	S
89.	UPB1088	S	R	R	S	S	MR	MS	R	R	MR	R	R	R	R	R	R	R
90.	UPB1089	S	R	MS	S	S	MR	MS	MR	MR	MR	S	S	S	S	S	S	S
91.	UPB1090	S	MS	MS	S	S	MR	MS	MR	MR	MR	S	S	S	S	MS	S	S
92.	VLB165	R	R	R	R	R	S	R	R	R	R	S	S	S	R	MS	R	R
93.	VLB166	R	R	R	R	R	S	MR	R	R	R	MS	MS	MS	MS	R	R	MS
94.	VLB167	NG	NG	NG	NG	NG	S	R	R	R	NG	NG	S	S	R	S	S	S
95.	VLB168	R	R	R	R	R	MS	S	S	MR	R	R	MS	S	S	MS	R	R
96.	VLB169	R	R	R	R	R	R	R	R	R	R	S	S	S	S	S	R	S
97.	BH902 (C)	S	S	MS	S	S	S	S	S	S	S	R	S	R	R	S	S	S
98.	BH946 (C)	S	S	MR	S	S	S	S	R	MR	MR	MS	S	S	MS	S	S	S
99.	BHS352(C)	MS	S	NG	MS	S	S	R	R	MR	R	S	S	S	S	S	MS	MS
100.	BHS400(C)	R	R	R	R	R	S	MR	MR	MS	R	MS	S	MR	MS	MS	MS	R
101.	DWRB101(C)	S	S	MS	MR	S	MR	R	MR	MR	R	S	S	S	S	S	S	MS
102.	DWRB123(C)	S	S	MS	S	S	MR	R	MR	R	R	S	S	S	S	S	R	S
103.	DWRB137(C)	MS	MS	R	MR	MS	S	MS	S	R	R	R	R	R	R	R	R	R
104.	DWRB160(C)	MR	S	MR	MS	S	S	R	MS	R	R	S	S	S	S	S	S	S

105.	HBL113(C)	R	R	R	R	R	MR	R	R	MR	R	R	R	R	R	R	R	R
106.	K603 (C)	S	MR	MS	S	S	MR	MR	MR	R	MR	MS	S	S	S	S	S	S
107.	Lakhan (C)	S	MR	MS	MS	S	R	MS	MR	R	R	S	S	S	S	S	S	S
108.	NDB1173(C)	S	MS	R	R	S	S	MS	MR	MR	MS	R	S	S	S	S	S	R
109.	NDB943(C)	S	S	R	MS	S	MR	MS	MR	R	R	S	S	S	NG	S	S	S
110.	PL891(I)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	R	NG	NG	S	NG	S
111.	RD2552(C)	S	R	MR	S	S	S	S	S	R	S	R	R	R	R	R	R	R
112.	RD2794(C)	S	S	R	S	S	R	R	MS	MS	MR	R	R	R	R	R	R	R
113.	RD2849 (C)	MS	MS	R	S	S	MR	R	MS	R	R	S	S	S	R	S	S	S
114.	RD2899(C)	MS	MR	R	MS	S	MR	S	S	MS	MR	R	R	R	R	R	R	R
115.	RD2907(C)	S	MS	R	S	S	R	S	MR	MR	S	R	R	R	R	R	R	R
116.	VLB118(C)	R	R	R	R	R	R	MR	R	R	R	S	S	S	R	MS	S	S

Table 10: Seedling response of EBDSN lines to the pathotypes of three rust pathogens of barley during 2019-20

S. No.	Line/Variety	Pathotypes																
		Brown Rust					Black rust					Yellow rust						
		H1	H2	H4	H5	Mix	11	21A-2	40A	117-6	122	57	24	M	G	Q	6S0	7S0
1.	BH-1011	MS	R	R	MR	MS	MS	R	MR	R	R	S	S	S	S	S	S	S
2.	BH-1018	MS	R	R	MS	MS	R	MR	R	R	R	S	S	S	S	S	S	MS
3.	BH-1025	S	R	MR	MS	S	MR	R	R	R	R	MR	R	S	MS	MS	R	R
4.	BK-1714	MR	R	S	R	S	R	S	R	R	R	R	R	R	R	R	R	R
5.	BK-1719 (LB)	R	R	R	R	R	MS	MS	MR	R	R	MS	MS	S	MS	MS	S	MS
6.	DWRB-101	MS	R	R	R	MS	MR	MR	R	R	R	MS	S	S	R	S	S	MS
7.	DWRB-123	MS	R	R	MR	MS	MS	R	R	R	MR	S	S	S	R	S	R	R
8.	DWRB-137	MR	R	MR	R	R	S	MS	S	R	MR	R	R	R	R	R	R	R
9.	DWRB-137	MS	R	MR	R	MS	S	MS	S	MR	R	R	R	R	R	R	R	R
10.	DWRB-182	MR	R	R	R	MR	R	R	R	R	R	R	R	R	R	R	R	R
11.	DWRB-184	R	R	R	R	R	MR	MR	R	R	R	S	S	S	R	MS	S	S
12.	DWRB-197	R	R	R	R	R	R	R	R	R	R	S	S	S	S	S	S	S
13.	DWRB-198	MS	R	R	MS	MS	MS	MR	MR	R	R	S	S	S	S	S	S	S
14.	HBL-113	R	R	R	R	R	MR	R	R	R	NG	R	R	R	R	R	R	R
15.	HBL-845	R	R	R	R	R	S	MR	MR	R	R	R	R	R	R	R	R	R
16.	HBL-848	S	S	R	R	S	S	S	MR	R	MS	R	R	R	R	R	R	R
17.	HBL-851	R	R	R	R	R	MR	S	R	R	R	MS	MS	MS	R	R	S	MS
18.	HBL-858	S	S	MS	MR	S	R	MS	R	R	R	R	MS	MS	MS	MS	MS	MS
19.	HBL-863	R	R	R	R	R	S	MR	MS	R	R	R	R	R	R	R	R	R

20.	HUB-268 (LB)	S	S	MR	R	S	MS	S	MR	R	MR	S	S	S	MS	S	S	S
21.	KB-1633	R	R	R	R	R	MR	S	S	R	S	S	S	S	S	S	S	S
22.	KB-1750	MS	MR	R	R	MS	MS	S	MS	R	R	S	S	S	S	S	S	S
23.	KB-1757	R	R	R	R	R	R	MR	R	R	R	S	S	S	S	R	S	S
24.	PL-891	NG	R	NG	NG	NG	NG	R	R	R	NG	NG	NG	R	NG	R	R	NG
25.	PL-906	S	MS	R	R	S	R	S	S	MR	S	R	R	R	R	R	R	R
26.	PL-908	R	R	R	R	R	MR	S	MR	MS	R	R	R	R	R	R	R	R
27.	PL-909	S	MS	R	R	S	R	S	R	MR	S	R	R	R	R	R	R	R
28.	PL-2899	MS	MS	R	R	MS	MR	S	MR	R	MS	R	R	R	R	R	R	R
29.	PL-2980	S	MR	MS	MR	S	R	S	S	R	S	R	R	R	R	R	R	R
30.	PL-2981	R	R	R	R	MR	MR	S	S	R	S	R	R	R	R	R	R	R
31.	PL-2994	R	MR	R	R	R	MR	S	S	R	MS	R	R	R	R	R	R	R
32.	PL-2999	R	R	R	R	R	MR	R	MR	R	MR	R	R	R	R	R	R	R
33.	PL-3000	R	R	R	R	R	MS	MS	S	R	R	R	R	R	R	R	R	R
34.	PL-3002	R	R	R	R	R	R	S	MR	MR	MR	R	R	R	R	R	R	R
35.	PL-3003	R	R	R	R	R	R	MS	MS	MR	MR	R	R	R	R	R	R	R
36.	PL-3004	R	R	R	R	R	R	S	MS	MR	MR	R	R	R	R	R	R	R
37.	PL-3005	MS	S	R	R	S	R	S	MR	MS	MS	R	R	R	R	R	R	R
38.	PL-3007	R	S	R	R	S	MR	MR	R	MS	R	S	S	S	S	S	S	S
39.	PL-3008 (LB)	R	MS	R	R	MS	R	S	R	R	R	MS	MS	MS	MS	S	R	MS
40.	PL-3009 (LB)	R	R	R	R	R	MR	MR	MR	R	MR	S	S	S	S	S	MS	R
41.	PL-3010	MS	R	R	MR	MS	R	R	R	R	R	R	S	S	R	S	MX	R
42.	UPB-1078	R	R	R	R	R	R	R	R	R	R	MR	S	S	S	S	S	R
43.	VLB-130	R	R	R	R	R	MR	S	R	R	R	R	MS	MS	S	MS	R	R
44.	VLB-164	R	R	R	R	R	MR	MS	MR	R	R	R	MS	S	R	MS	S	S

Management of stripe rust of barley through chemicals

The experiment was conducted in RBD with three replications at Ludhiana, Karnal, Jammu and Durgapura. Yellow rust susceptible variety was planted six rows of 3 m length plots at row to row distance of 25 cm and recommended packages of practices were followed. Three replications were maintained. The fungicides were sprayed after first appearance of yellow rust and observations were taken at various intervals.

Five different fungicides were evaluated for their efficacy to manage the yellow rust at four locations (Table 11). Among these treatments Tebuconazole 50% + Trifloxystrobin 25% WG @ of 0.06% was found most effective at Durgapura and Karnal location where as at Ludhiana and Jammu Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE gave maximum diseases control. The highest yield was recorded with Tebuconazole 50% + Trifloxystrobin 25% WG @ of 0.06% across the locations.

Table 11: Management of yellow rust through chemicals

Treatments	Dose (%)	Ludhiana		Durgapura		Karnal		Jammu	
		YR ACI	Yield (q/ha.)	YR ACI	Yield (q/ha.)	YR ACI	Yield (q/h)	YR ACI	Yield (q/ha)
Picoxystrobin 7.05% + Propiconazole 11.7% SC,	0.10	1.67	48.2	6.3	51.56	6.0	33.7	14.3	31.8
Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE,	0.10	1.33	46.83	5.7	52.44	4.0	40.4	1.2	35.2
Tebuconazole 50% + Trifloxystrobin 25% WG	0.06	1.67	48.47	3	53.71	2.7	44.8	7.5	34.2
Propiconezole	0.10	1.33	45.33	8.3	49.93	5.3	36.4	9.3	32.9
Tebuconazole	0.10	3	43.63	5	52.67	5.3	32.3	26.0	29.4
Control (without chemicals)		60	30.53	100	20.96	80.0	20.2	83.3	17.6
CD (P=0.05)		4.58	2.66	1.16	1.11	3.96	2.1	4.5	1.2

ENTOMOLOGY

During the cropping season of 2019-20, following experiments were allotted for entomology discipline. These are listed as below:

S. No.	Title	Centres
1	Screening of NBDSN barley entries against foliar aphids	Ludhiana, Kanpur, Karnal
2.	Management of aphids through foliar application of new bio-chemical molecules	Ludhiana, Vijapur, Kanpur and Karnal
3.	Survey and surveillance of insect-pests and their natural enemies in barley	All centres

Screening of NBDSN barley entries (2019-20) against foliar aphids

A total of one hundred sixteen barley NBDSN entries (including checks and infector) were screened against aphids at three locations as per the planned programme of work during 2019-20. The seeds were supplied by IIWBR, Karnal. Aphid population per shoot was recorded at weekly interval from all entries and grades were given according to 5-point system as described below.

Grade/ Score	Approx. numbers of aphids/shoot	Rating
1	0	Immune (I)
2	1-5	Resistant (R)
3	6-10	Moderately resistant (MR)
4	11-20	Susceptible (S)
5	21and above	Highly susceptible (HS)

Majority of the entries at all the locations harboured aphids in different range depending upon their incidence level. The number of aphids recorded per shoot was converted into scale of 1-5. Based on the scale, the entries were categorized either as immune (grade 1) or resistant (grade 2), or moderately resistant (grade 3) or either susceptible (grade 4) or highly susceptible (grade 5) to aphids (Table 3).

This year, entries were found in category grades of 2 to 5. At Kanpur centre, 6 entries were found to be in resistant category (grade 2) BH1028, HBL867, PL908, PL912, RD3022 and Lakhan (C) and 3 entries (PL915 RD3026 &PL891(C)) were moderately resistant (grade 3). At Ludhiana centre, three entries viz., PL906, HBL113(C) and RD2899(C) were found to be moderately resistant (grade 3), however in Karnal entry PL912 was rated as moderately resistant (3). Overall based on the average score of three locations, five entries BH1028, HBL867, PL908, PL912 & RD3022 fall under moderately resistant category (grade 3) (Table 5).

In addition to NBDSN lines, 4 more promising entries along with highly susceptible check (Alfa-93) were tested against aphids at two locations (Kanpur & Karnal) during 2019-2020. All four tested entries viz., BCLA 3, BCLA 11-6, BCLA 17 and BCLA 18 were found to be in resistant category (grade 2) (Table 12).

Table 12: Screening of promising barley entries against foliar aphids during 2019-20

Entry No.	Kanpur					Karnal					Overall Av. score	Overall HS
	Date of observation			Av. score	HS	Date of observation			Av. score	Highest score		
	05.02.20	12.02.20	19.02.20			03.02.20	17.02.20	02.03.20				
BCLA 3	1	2	1	1.3	2	2	2	2	2.0	2	1.7	2
BCLA 11-6	1	2	1	1.3	2	2	2	2	2.0	2	1.7	2
BCLA 17	2	2	2	2.0	2	2	2	2	2.0	2	2.0	2
BCLA 18	2	2	2	2.0	2	2	2	2	2.0	2	2.0	2
ALFA - 93	5	5	5	5.0	5	5	5	5	5.0	2	5.0	5

Management of aphids through foliar spray of new chemical molecules

The objective of conducting this experiment is to test the new molecules against aphids infesting barley and to find out the most effective insecticide against the pest. The experiment was conducted at three locations Ludhiana, Vijapur, Kanpur and Karnal during 2019-18 season with eight treatments. Five tillers were tagged from each plot and the experiment was replicated three times. The aphids were counted from these tagged plants before spray and after spray to know the efficacy of each treatment. The grain yield was recorded to know the amount preventable losses by these treatments.

Location: Ludhiana

The studies were conducted under irrigated conditions at Plant Breeding Research Farm, PAU, Ludhiana. The wheat variety PL 807 was sown on 5th Nov.2019 in the plots of 6 rows of 6m long in a replicated trial. There were eight treatments including untreated check and each was replicated three times. For recording observations, five tillers were ear marked in each plot and observations were recorded 1 day before spray and then 1, 2, 7 and 15 days after spray.

Aphid population did not differ significantly among all treatments one day before treatment. When observed one day after spray, Beta-Cyfluthrin 9%+ Imidacloprid 21% (2.03 aphids/tiller) recorded minimum aphids/tiller and was at par with all other treatments and better than untreated control (22.76 aphids/tiller). Similar results were recorded 2 days after treatment however Beta-cyfluthrin (1.27 aphids/tiller) and Sulfoxaflor (2.05 aphids/tiller) were the best treatments 7 and 15 days after spray.

Grain yield (q/ha) obtained was maximum (54.57) from Beta-cyfluthrin 25 SC treated plots followed by Sulfoxaflor (54.48) treated plots. However, all the foliar insecticidal treatments recorded higher grain yield than untreated check (51.64) (Table 13).

Location: Vijapur

An experiment on management of aphids through foliar application of new bio-chemical molecules was conducted at Wheat Research Station, Vijapur under irrigated condition. The barley variety RD 2052 was sown on 26-11-2019. Aphid populations did not differ statistically

among all treatments during 24hrs before spraying. On 1st day after spray, there were overall decreased in numbers of aphids/shoot in all the treatments as compared to untreated check. While, after 2nd day of spray the minimum aphid population was noticed in Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon) and it was at par with all other treatments except untreated check. On 7th day after spray, minimum no. of aphid population was recorded under Sulfoxaflor 12 % SC and it was at par with all the treatments except untreated check. Observation taken after 15th day after spray showed that significantly the lowest aphid population was reported in treatment of Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon) and it was at par with all the treatments except untreated check. Thus, all the insecticidal treatments achieved significantly lower aphid populations than untreated check. The grain yield (q/ha) showed non-significant differences among all the treatments. Though, the maximum grain yield increase over check was recorded under treatment of Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon) followed by the treatments of Lambda cyhalothrin 5 % EC and Acetamiorid 20 SP (Table 14).

Location: Karnal

An experiment on management of aphids through foliar application of new bio-chemical molecules was conducted at Research farm of ICAR-IIWBR Karnal under irrigated condition. There were eight treatments including untreated check and each was replicated three times. For recording observations, five tillers were ear marked in each plot and observations were recorded 1 day before spray and then 1, 2, 7 and 15 days after spray.

Before the application of treatments, there was no significant difference among the aphid counts made in different plots. After one of spraying, aphid populations were recorded to be lowest (2.09 aphids/tiler) in Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon)i.e. 2.96 aphids/tiller followed by Imidacloprid 17.8 SL. i.e. 3.03 aphids/tiller. After 2nd day of spray again Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon) had the minimum aphid population (2.02 aphis/tiller) followed by Sulfoxaflor 12 % SC (2.16 aphids/tiller). Similar trends were seen after 7 and 15 days of spraying.

The highest grain yield of 52.39 q/ha was recorded Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon) treatment followed by Sulfoxaflor 12 % SC (52.36 q/ha). All the insecticidal treatment recorded significantly higher than untreated check (50.25 q/ha) (Table 15).

Location: Kanpur

The experiment was conducted under irrigated condition at research farm Nawabganj C.S.A. Univ., Kanpur. The barley variety K 551 was sown on 24.1.2019 in plot of 23 rows of 3m length. These were total of 8 treatments including untreated check and each was replicated thrice. For recording the observation, five shoots were randomly selected in each plot and observation were recorded 24 hr before spray and thereafter at 1 ,2, 7- and 15-days interval on these plants.

The number of aphids recorded 24 hr. before spray did not differ significantly but after one day of application of insecticides, it was observed that acepamiprid 20 SP and flubendamide 480 SC spray after one day recorded 6.84 and 7.09 aphid population. After days these insecticides recorded the lowest population of 3.72 and 5.61 apids/tiller. Overall, 15 days after spray out of all tested treatments, acepamiprid 20 SP recorded lowest number of aphids/tillers. Grain yield q/ha was maximum (55.57q/ha and 53.99q/ha) from acepamiprid 20 SP fludendamide 480SC respectively, followed by imidacloprid 17.8% (52.66 q/ha). However, all the insecticidal treatment recorded significantly higher than untreated check (42.44 q/ha) (Table 16).

Table 13: Management of aphids through foliar application of new bio-chemical molecules (2019-20). (Location: Ludhiana)

S. No.	Treatments	Dose ml or g / ha	Aphid population per earhead					Grain Yield (q/ha)
			Before spray	After spray				
			1 day	1 day	2 days	7 days	15 days	
1	Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika)	150 ml	22.16	2.20 (1.78)	1.91 (1.70)	1.49 (1.57)	2.20 (1.78)	54.26
2	Thiamethoxam 25% WG	50	22.28	2.17 (1.77)	1.93 (1.71)	1.45 (1.56)	2.26 (1.80)	54.31
3	Lambda cyhalothrin 5% EC	500	22.53	2.09 (1.75)	1.90 (1.70)	1.40 (1.54)	2.27 (1.80)	54.13
4	Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon)	400	22.82	2.03 (1.73)	1.89 (1.70)	1.35 (1.53)	2.19 (1.78)	54.22
5	Imidacloprid 17.8 SL	400	22.95	2.10 (1.75)	1.83 (1.68)	1.29 (1.51)	2.10 (1.76)	54.35
6	Beta-cyfluthrin 25 SC	1450	22.97	2.12 (1.76)	1.94 (1.71)	1.27 (1.50)	2.07 (1.75)	54.57
7	Sulfoxaflor 12% SC	250 ml	22.89	2.15 (1.77)	1.86 (1.69)	1.29 (1.51)	2.05 (1.74)	54.48
8	Untreated control	-	22.94	22.76 (4.87)	19.92 (4.57)	18.71 (4.44)	16.06 (4.13)	51.64
CD (p=0.05)			NS	(0.13)	(0.07)	(0.12)	(0.12)	1.48

Figures within parentheses arc transformed means

Date of sowing : 05.11.2019
Date of insecticidal application : 06.03.2019
Date of harvest : 27.04.2019
Plot size : 7.5 m^2
Variety : PL 807
Replications : Three

Table 14: Management of aphids through foliar application of new bio-chemical molecules (2019-20) (Location: Vijapur)

Sr. No.	Treatment	Doses g.a.i./ha	Aphid population per shoot					Grain yield (q/ha)
			Before spray (days)	After spray (days)				
				1st	2nd	7th	15th	
1	Thiamethoxam 12.6 % + Lambda cyhalothrin 9.5% ZC (Alika)	33.15 (18.9+14.25)	20.27	9.07a	5.87a	3.60a	1.13a	57.75
2	Thiamethoxam 25 % WG	12.5	15.60	9.80a	6.67a	3.87a	2.13a	55.94
3	Lambda cyhalothrin 5 % EC	25	18.27	9.67a	6.27a	3.87a	0.80a	58.70
4	Beta-Cyfluthrin 9 % + Imidacloprid 21 % (Solomon)	(8.49+19.81 % w/w)	17.40	7.67a	5.80a	2.53a	0.53a	64.13
5	Imidacloprid 200 SL (Confidor 17.8)	20	21.20	9.00a	5.47a	3.27a	2.40a	53.19
6	Acetamiorid 20 SP	20	17.93	8.40a	5.40a	3.33a	1.07a	58.62
7	Sulfoxaflor 12 % SC	30	17.13	9.70a	6.27a	2.47a	1.53a	57.25
8	Untreated Check	-	19.67	23.00b	25.47b	29.87b	27.47b	44.64
		S. Em ±	1.53	1.07	1.01	1.04	0.85	4.03
		C.D. at 5%)	NS	3.23	3.07	3.15	2.57	NS
		C.V. %	14.42	17.10	20.88	27.28	31.69	12.41

*Figures followed with same letter(s) are not differed statistically

Date of sowing : 26/11/2019 Date of insecticide application : 06/01/2020
Date of harvesting : 23 /03/2020
Design : R.B.D Replications : Three
Spacing : 23 cm between row No. of rows / plot : 6
Plot size : Gross: 6.0m x 1.38m Net : 5.0 m x 0.92m
Variety : RD 2052 Condition : Irrigated

Table 15: Management of aphids through foliar application of new bio-chemical molecules (2019-20). (Location: Karnal)

S. No.	Treatments	Doses g.a.i./ha	Dose ml or g / ha	Aphid population per earhead					Grain Yield (q/ha)
				Before spray	After spray				
				1 day	1 day	2 days	7 days	15 days	
1	Thiamethoxam 12.6% + Lambda cyhalothrin 9.5% ZC(Alika)	33.15 (18.9+14.25)	150 ml	25.12	3.13 (2.03)	2.56 (1.89)	1.85 (1.69)	1.64 (1.62)	52.10
2	Thiamethoxam 25% WG	12.5	50	24.82	3.11 (2.02)	2.62 (1.90)	1.78 (1.67)	1.57 (1.60)	51.99
3	Lambda cyhalothrin 5% EC	25	500	24.05	3.02 (2.00)	2.59 (1.89)	1.69 (1.64)	1.48 (1.57)	51.26
4	Beta-Cyfluthrin 9%+ Imidacloprid 21% (Solomon)	(8.49+19.81 % w/w)	400	25.41	2.96 (1.99)	2.02 (1.74)	1.31 (1.52)	1.11 (1.45)	52.39
5	Imidacloprid 17.8 SL	20	400	25.03	3.03 (2.01)	2.48 (1.87)	1.51 (1.58)	1.30 (1.52)	51.35
6	Beta-cyfluthrin 25 SC	20	1450	25.56	3.05 (2.01)	2.22 (1.79)	1.49 (1.58)	1.28 (1.51)	52.02
7	Sulfoxaflor 12% SC	30	250 ml	24.23	3.08 (2.02)	2.16 (1.78)	1.42 (1.56)	1.21 (1.49)	52.36
8	Untreated control	-	-	25.02	23.69 (4.97	20.57 (4.64)	18.93 (4.46)	18.72 (4.44)	50.25
CD (p=0.05)				NS	(0.16)	(0.11)	(0.17)	(0.18)	1.48

***** Figures in parentheses indicate V_{n+1} transformed value

Date of sowing : 10-11-2019
Date of insecticide application : 20-02-2020
Date of harvest : 17-04-2020
Plot size : Six row of six meter length at 25 cm spacing
Variety : DWRUB64
Replication : Three

Table 16: Management of foliar aphids through biopesticides & chemicals (2019-20) (Location: Kanpur)

S.No.	Treatments	Actual dose ml/g/ha	Aphid population per main shoot					Grain yield (q/ha)
			Before spray	After spray				
			1 day	1day	2 days	7 days	15 days	
1.	Imidacloprid (17.8% SL)	100ml	11.16	7.66 (16.11)	5.80 (13.94)	6.86 (15.23)	6.19 (14.42)	52.66
2.	Flubendamide (Fame 480 SC)	250ml	10.92	7.09 (15.45)	5.33 (13.31)	6.40 (14.65)	5.61 (23.26)	53.99
3.	Acetamiprid 20SP	100g	10.17	6.84 (15.12)	4.05 (11.54)	4.43 (12.11)	3.72 (11.09)	55.57
4.	Chlorantaniliprid (Coragen) 18.5 SC	100ml	11.2	12.81 (20.96)	12.69 (20.88)	21.83 (27.83)	11.92 (20.18)	50.89
5.	Azadirachtian 1500ppm	3ml/lit.	10.23	15.30 (23.03)	18.06 (25.18)	31.57 (34.20)	31.67 (34.27)	45.78
6.	*Beauveria bassiana*	5.0g/lit.	10.75	9.28 (17.76)	11.72 (20.00)	10.33 (18.72)	10.27 (18.63)	51.55
7.	*Metarhizium anisopliae*	3.0g/lit.	9.37	10.31 (18.72)	15.67 (23.34)	27.20 (231.44)	26.53 (30.98)	49.33
8.	Control	-	11.03	18.65 (25.62)	27.30 (31.50)	89.58 (71.19)	78.45 (62.37)	42.44
S.Em ±		-	NS	0.186	0.436	0.406	1.674	1.182
CD 5%		-	NS	0.568	1.334	1.244	5.127	3.619

Date of sowing : 24.11.2019
Date of insecticidal application: 27.01.2020
Date of harvest : 30.04.2020
Design : R.B.D.

Plot size : 3 m x 5m = 15 Sqm
Variety : K551
No. of rows/plot : 23
Replication : Three

CO-OPERATORS

Plant Pathology

S N	Centre	Cooperators
1	Karnal	Dr. Sudheer Kumar
2	Ludhiana	Dr. Jaspal Kaur
3	Durgapura	Dr. P. S. Shekhawat
4	Bajaura	Dr. Rakesh Devlash
5	Hisar	Dr. R.S. Beniwal
6	Almora	Dr. K. K. Mishra
7	Jammu	Dr. M. K. Pandey
8	Pantnagar	Dr. Deepshikha
9	Kanpur	Dr. Javed Bahar
10	Faizabad	Dr. S.P. Singh
11	Varanasi	Dr. S.S. Vaish
12	Dharwad	Dr. P.V. Patil
13	Flowerdale, Shimla	Dr. S.C. Bhardwaj Dr. O.P. Gangwar Dr. P. Prasad

Entomology

S N	Centre	Cooperators
1	Karnal	Dr. Poonam Jasrotia
2	Vijapur	Dr. A. A. Patel
3	Ludhiana	Dr. Beant Singh
4	Kanpur	Dr. J. Kumar
5	Durgapura	Dr. A. S. Baloda

Nematology

S N	Centre	Cooperators
1	Durgapura	Dr. S. P Bishnoi
2	Ludhiana	Dr. Ramanna Koulagi
3	Hisar	Dr. (Ms.) Priyanka Duggal

RESOURCE MANAGEMENT

Different centres under AICRP Wheat and Barley are engaged in agronomic evaluation of new genotypes and for updating the package and practices under different agro-climatic conditions. Input management *viz.* Seed, water, nutrients under resource scarce conditions, fine-tuning of spacing and nutrient requirements of different varieties under changing climatic conditions, micro nutrient supply, crop management are the priority researchable areas in barley agronomy. In spite of the fact that the crop is being grown mostly on fringe and problematic lands, the productivity increased during recent years and the newly developed improved technologies contributes in this increase in productivity.

The details of the coordinated and special trials (proposed and conducted) are reported in Table 1. A total of 31 trials were proposed and conducted at different locations and 30 were reported, data of one trial at Karnal could not be included in pooled analysis because irrigation treatment could not be imposed in the irrigation trial due to frequent rain.

Table 1: Details of barley coordinated and special trials during 2019-20

Trial Name	Number of trials			
	Proposed locations	**Not conducted / Failed**	**Data Received**	**Data Reported**
Coordinated Trials				
IR-TS-MB- LON	**5**	-	**5**	**5**
Special trials				
Tillage x Varieties (NHZ)	2	-	2	2
Irrigation X Varieties (NWPZ, NEPZ, CZ)	8		8	7
Pusa Hydrogel and herbal hydrogel (NWPZ)	3	-	3	3
Nutrient Management System (NHZ)	2	-	2	2
Zn application x varieties (NWPZ, NEPZ, CZ, NHZ)	11	-	11	11
Total	31	-	31	30

NEW VARITIES EVALUATION

Response of new malt barley genotypes to different N levels under irrigated timely sown conditions

In case of AVT–IR-TS-malt barley in NWPZ, test entry DWRB 182 (45.26 q ha^{-1}) was yielding 4.25-5.51 % less to recently released two row and six row checks. The genotypes responded up to 90 kg Nitrogen/ha and more application of nitrogen (120 kg/ha) produced similar yield may be due to the lodging at some locations. The trial was conducted at Agra, Durgapura, Ludhiana, Hisar and Karnal centers during the season with DWRB182 as test entry and DWRB101, RD2849, DWRB123, DWRB160(all two-row), and BH 946(6R-C) as checks.

Table 2 **NWPZ** **POOLED** **2019-20**

IR-TS-Malt-N levels x Varieties

Varieties	N (Kg ha^{-1}) 60 Yld.	60 Rk.	90 Yld.	90 Rk.	120 Yld.	120 Rk.	Mean Yld.	Mean Rk.
Yield, q/ha								
DWRB182	42.47	5	46.81	6	46.50	6	45.26	6
DWRB101(c)	44.12	3	49.51	3	48.56	5	47.40	4
RD2849(c)	45.47	2	48.76	5	49.46	3	47.90	2
DWRB123(c)	43.95	4	49.24	4	48.64	4	47.27	5
DWRB160(I)	42.42	6	50.16	2	50.80	2	47.79	3
BH 946(c)	46.73	1	52.90	1	54.38	1	51.34	1
MEAN	44.19		49.56		49.72		47.83	
CD (0.05)	N(A) 0.85		Varieties (B) 1.13		B within A 1.96		A within B 1.97	
Earhead/ m^2								
DWRB182	417	3	433	5	444	4	431	3
DWRB101(c)	436	1	443	2	445	3	441	2
RD2849(c)	432	2	443	1	456	1	444	1
DWRB123(c)	413	4	440	3	440	5	431	4
DWRB160(I)	408	5	436	4	446	2	430	5
BH 946(c)	393	6	406	6	418	6	406	6
MEAN	417		433		442		430	
CD (0.05)	N (A) 6.75		Varieties (B) 7.53		B within A NS		A within B NS	
Grains/Earhead								
DWRB182	25.08	5	26.56	6	26.76	6	26.13	6
DWRB101(c)	24.88	6	27.37	5	27.28	3	26.51	5
RD2849(c)	26.32	2	27.59	3	27.49	2	27.13	2
DWRB123(c)	26.13	3	27.58	4	26.97	4	26.89	3
DWRB160(I)	25.48	4	27.89	2	26.95	5	26.77	4
BH 946(c)	45.17	1	46.62	1	46.09	1	45.96	1
MEAN	28.84		30.60		30.26		29.90	
CD (0.05)	N (A) 0.62		Varieties (B) 0.91		B within A NS		A within B NS	
1000 Grain Weight (g)								
DWRB182	45.67	5	47.21	5	46.74	5	46.54	5
DWRB101(c)	50.02	3	49.53	4	50.20	3	49.92	3
RD2849(c)	48.97	4	49.86	3	49.27	4	49.37	4
DWRB123(c)	51.43	2	52.42	2	52.29	2	52.05	2
DWRB160(I)	58.63	1	58.71	1	58.49	1	58.61	1
BH 946(c)	42.02	6	43.87	6	43.19	6	43.03	6
MEAN	49.46		50.27		50.03		49.92	
CD (0.05)	N (A) 0.87		Varieties (B) 1.28		B within A NS		A within B NS	

Centres: Agra, Durgapura, Ludhiana, Hisar, Karnal

PRODUCTION TECHNOLOGIES UPDATION

To increase the production, productivity and profitability of the barley growing farmers, updating of package of practices of barley crop is continuous process and the need of the hour. Five special trials were conducted in different zones to achieve this objective. The results from these trials are presented below.

SPL 1 Effect of conservation agricultural practices on productivity of barley in NHZ

The trial was conducted at Bajaura and Malan in split plot design by taking tillage in main plot and varieties in sub plot. The tillage practices conventional (33.51 q/ha) and zero tillage + residue (32.08 q/ha) were at par and superior to zero tillage alone and the trend was followed by most of the individual varieties. BHS 400 registered significantly highest grain yield (43.43 q ha^{-1}) compared to all other varieties which is followed by VL 118 (37.24q/ha) under conventional tillage.

Table 3 **NHZ** **POOLED** **2019-20**

SPL-1 Tillagex Varieties

Varieties	Tillage Practices						Mean	
	ZT		CT		ZT+Residue@6 tha^{-1}			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha								
VLB118	32.55	2	37.24	2	36.85	2	35.55	2
BHS 400	35.35	1	43.43	1	42.15	1	40.31	1
HBL 113	31.56	3	35.15	3	32.60	3	33.10	3
BHS 352	19.09	5	26.82	4	24.68	4	23.53	4
HBL 276	21.13	4	24.93	5	24.15	5	23.40	5
MEAN	27.94		33.51		32.08		31.18	
CD (0.05)	Tillage (A)		Varieties (B)		B within A		A within B	
	2.16		2.23		NS		NS	
Earhead/ m^2								
VLB118	308.7	3	322.5	3	326.2	3	319.1	3
BHS 400	344.3	2	361.0	2	369.5	1	358.3	2
HBL 113	354.7	1	383.2	1	367.7	2	368.3	1
BHS 352	282.5	4	291.0	5	291.3	5	288.3	5
HBL 276	280.8	5	297.2	4	292.3	4	290.1	4
MEAN	314.1		330.9		329.4		324.8	
CD (0.05)	Tillage (A)		Varieties (B)		B within A		A within B	
	NS		12.6		NS		NS	
Grains/Earhead								
VLB118	25.52	2	26.83	2	26.41	2	26.26	2
BHS 400	26.19	1	30.45	1	29.19	1	28.61	1
HBL 113	22.11	4	22.70	5	22.68	5	22.50	5
BHS 352	21.37	5	25.01	3	23.22	3	23.20	4
HBL 276	22.29	3	24.44	4	23.06	4	23.26	3
MEAN	23.50		25.89		24.91		24.76	
CD (0.05)	Tillage (A)		Varieties (B)		B within A		A within B	
	0.88		1.39		NS		NS	
1000 Grain Weight, g								
VLB118	41.17	2	44.85	1	45.86	1	43.96	1
BHS 400	42.49	1	43.69	2	43.58	2	43.25	2
HBL 113	38.62	3	40.08	4	41.60	3	40.10	3
BHS 352	36.63	5	40.35	3	37.54	5	38.17	4
HBL 276	36.89	4	38.93	5	38.44	4	38.09	5
MEAN	39.16		41.58		41.40		40.71	
CD (0.05)	Tillage (A)		Varieties (B)		B within A		A within B	
	0.66		1.43		NS		NS	

Centres: Bajaura and Malan

Yield, q/ha (Three-year Pooled data)								
VLB118	30.86	2	36.14	3	36.56	2	34.52	2
BHS 400	34.87	1	43.32	1	41.13	1	39.77	1
HBL 113	29.74	3	36.96	2	33.42	3	33.37	3
BHS 352	19.24	5	25.01	4	22.93	4	22.39	4
HBL 276	20.02	4	23.67	5	22.20	5	21.96	5
MEAN	26.94		33.02		31.25		30.40	
CD (0.05)	Tillage (A)		Varieties (B)		B within A		A within B	
	0.74		1.69		NS		NS	

Three years data also concludes that conventional tillage and zero tillage + residue were superior to zero tillage alone and the trend was followed by most of the individual varieties. BHS 400 registered significantly highest grain yield followed by VL 118 compared to all other varieties.

SPL 2 Irrigation management in different varieties under NWPZ, NEPZ and CZ conditions

The trial was conducted with four irrigation level and two varieties in split plot design under different zones. In NWPZ, the trial was conducted at Agra, Hisar, Ludhiana and Karnal. The data of Karnal was not included in pooled analysis because the irrigation treatment could not be imposed due to frequent rain. The two irrigations, one at 30DAS and other at 60-65 DAS, treatment was found sufficient to produce optimum grain yield. Three and two irrigation levels were at par. Six-row variety BH946 and two-row variety DWRB160 were at par at all irrigation level, but numerically BH946 was superior.

Table 4 NWPZ Pooled 2019-20

SPL-2 Irrigation x Varieties

	Irrigation									
Varieties	**Zero**		**One**		**Two**		**Three**		**Mean**	
	Yield q/ha									
	Yield	**Rk**	**Yield**	**Rk**	**Yield**	**Rk**	**Yield**	**Rk**	**Yield**	**Rk**
BH 946	36.75	1	44.93	1	48.33	1	50.29	1	45.08	1
DWRB 160	34.71	2	43.93	2	47.57	2	49.12	2	43.84	2
MEAN	35.73		44.43		47.95		49.71		44.46	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	2.92		NS		NS		NS			
	Earhead/ m^2									
BH 946	315.0	2	332.7	2	345.9	2	356.5	2	337.5	2
DWRB 160	321.0	1	348.4	1	363.3	1	360.4	1	348.3	1
MEAN	318.0		340.6		354.6		358.4		342.9	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	11.1		7.28		NS		NS			
	Grains/Earhead									
BH 946	37.73	1	40.38	1	40.63	1	41.36	1	40.02	1
DWRB 160	25.88	2	25.49	2	26.74	2	25.60	2	25.93	2
MEAN	31.80		32.94		33.68		33.48		32.98	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	1.14		2.50		NS		NS			
	1000 Grain Weight, g									
BH 946	38.68	2	41.44	2	42.27	2	43.11	2	41.37	2
DWRB 160	57.58	1	62.03	1	63.16	1	64.26	1	61.76	1
MEAN	48.13		51.73		52.71		53.68		51.57	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	1.74		2.36		NS		NS			

Centres: Agra, Hisar, Ludhiana

In NEPZ, the trial was conducted at Faizabad, Kanpur and Varanasi. The yield increased as the level of irrigation increased and the genotypes responded up to three irrigation level. The yield was 29.09, 35.62, 39.52 and 42.56 q/ha with zero, one, two and three irrigations, respectively. The variety DWRB137 was superior to HUB113 at all irrigation level except zero irrigation where both were at par.

Table 5 NEPZ Pooled 2019-20

SPL-2 Irrigation x Varieties

Varieties	Irrigation									
	Zero		One		Two		Three		Mean	
	Yield q/ha									
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
DWRB137	28.95	2	36.62	1	40.32	1	43.13	1	37.26	1
HUB113	29.23	1	34.62	2	38.71	2	41.98	2	36.13	2
MEAN	29.09		35.62		39.52		42.56		36.70	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	1.76		0.89		NS		NS			
	Earhead/ m^2									
DWRB137	315.8	1	324.7	1	337.2	1	341.4	1	329.8	1
HUB113	310.4	2	321.1	2	333.7	2	336.7	2	325.5	2
MEAN	313.1		322.9		335.4		339.1		327.6	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	6.10		3.72		NS		NS			
	Grains/Earhead									
DWRB137	29.75	2	34.54	2	36.59	1	38.38	2	34.81	2
HUB113	30.74	1	34.55	1	36.58	2	40.30	1	35.54	1
MEAN	30.25		34.54		36.59		39.34		35.18	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	1.44		NS		NS		NS			
	1000 Grain Weight, g									
DWRB137	38.25	1	40.35	1	40.83	1	40.37	1	39.95	1
HUB113	37.26	2	38.67	2	39.77	2	38.40	2	38.52	2
MEAN	37.75		39.51		40.30		39.39		39.24	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	0.90		0.83		NS		NS			

Centres: Faizabad, Kanpur, Varanasi

In CZ, the trial was conducted at Udaipur. The yield increase was up to two irrigation level in DWRB137 and up to three irrigation level in RD 2899. On an average, the yield increased significantly up to three irrigations. The variety RD2899 was superior to DWRB137 at all irrigation level.

Table 6 CZ Udaipur 2019-20

SPL-2 Irrigation x Varieties

Varieties	Irrigation									
	Zero		One		Two		Three		Mean	
	Yield q/ha									
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
DWRB137	26.19	2	39.80	2	44.06	2	44.89	2	38.74	2
RD2899	30.36	1	43.60	1	44.99	1	52.39	1	42.83	1
MEAN	28.27		41.70		44.52		48.64		40.79	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	3.87		2.60		NS		NS			

					Earhead/ m²					
DWRB137	241. 7	2	338. 3	2	348.3	2	373.3	2	325.4	2
RD2899	265.0	1	356. 7	1	366.7	1	391.7	1	345.0	1
MEAN	253. 3		347.5		357.5		382.5		335.2	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	9.25		15.9		NS		NS			
					Grains/Earhead					
DWRB137	37.33	2	39.67	2	39.67	2	40.67	2	39.33	2
RD2899	39.33	1	41.67	1	43.33	1	44.00	1	42.08	1
MEAN	38.33		40.67		41.50		42.33		40.71	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	1.99		2.29		NS		NS			
					1000 Grain Weight, g					
DWRB137	37.58	2	43.27	2	44.92	2	45.27	2	42.76	2
RD2899	39.93	1	44.85	1	46.02	1	46.85	1	44.41	1
MEAN	38.76		44.06		45.47		46.06		43.59	
CD (0.05)	Irrigation(A)		Varieties(B)		B within A		A within B			
	0.47		1.01		NS		NS			

Centres: Udaipur

SPL-3 Evaluation of New molecule and Pusa Hydrogel (NWPZ)

The trial was conducted at Agra, Durgapura and Hisar. Application of Pusa Hydrogel @ 2.5 kg ha-1 and New Hydrogel @ 2.5 kg ha-1 resulted in significantly higher grain yield as compared to control conditions in NWPZ. The hydrogel with two irrigations and no hydrogel with three irrigations were at par and so we can save one irrigation water with the use of hydrogel to produce the same level of yield. Both the hydrogels were at par at all irrigation level.

Table 7 NORTH WESTERN PLAINS ZONE Pooled 2019-20

SPL-5 Irrigation x Hydrogel

Hydrogel	**Irrigation numbers**									
	No irrigation		One		Two		Three		Mean	
						Yield q/ha				
	Yield	**Rk**	**Yield**	**Rk**	**Yield**	**Rk**	**Yield**	**Rk**	**Yield**	**Rk**
Control	21.76	3	34.92	3	41.69	3	45.59	3	35.99	3
Pusa Hydrogel @ 2.5 kg ha^{-1}	25.92	2	39.86	2	45.45	2	48.47	2	39.93	2
New Hydrogel @ 2.5 kg ha^{-1}	26.66	1	40.24	1	45.63	1	49.25	1	40.44	1
MEAN	24.78		38.34		44.25		47.77		38.79	
CD (0.05)	Irrigation levels(A)			Hydrogel(B)			B within A		A within B	
	1.31			**0.94**			**NS**		**NS**	
					Earhead/ m²					
Control	203.5	3	257.0	3	284.8	3	297.6	3	260.7	3
Pusa Hydrogel @ 2.5 kg ha^{-1}	226.6	2	269.3	2	289.9	2	312.4	1	274.6	2
New Hydrogel @ 2.5 kg ha^{-1}	228.9	1	271.5	1	294.8	1	309.6	2	276.2	1
MEAN	219.6		266.0		289.9		306.5		270.5	
CD (0.05)	Irrigation levels(A)			Hydrogel(B)			B within A		A within B	
	10.1			**6.70**			**NS**		**NS**	

Grains/Earhead										
Control	36.09	3	40.81	3	42.72	3	43.09	3	40.68	3
Pusa Hydrogel @ 2.5 kg ha^{-1}	37.55	2	42.62	2	43.99	2	45.08	2	42.31	2
New Hydrogel @ 2.5 kg ha^{-1}	38.86	1	43.17	1	44.53	1	45.39	1	42.99	1
MEAN	37.50		42.20		43.75		44.52		41.99	
CD (0.05)	Irrigation levels(A)			Hydrogel(B)			B within A		A within B	
	1.40			**1.56**			**NS**		**NS**	
1000 grains wt. (g)										
Control	39.15	3	41.01	3	42.36	3	44.25	3	41.69	3
Pusa Hydrogel @ 2.5 kg ha^{-1}	41.72	1	42.77	2	44.97	1	45.01	2	43.62	2
New Hydrogel @ 2.5 kg ha^{-1}	41.49	2	43.06	1	44.77	2	45.20	1	43.63	1
MEAN	40.79		42.28		44.03		44.82		42.98	
CD (0.05)	Irrigation levels (A)			Hydrogel(B)			B within A		A within B	
	1.33			1.03			NS		NS	
Centres: Durgapura, Hisar and Agra										
Yield, q/ha (Two year pooled data)										
Control	38.55	3	40.99	3	42.60	3	43.75	3	41.47	3
Pusa Hydrogel @ 2.5 kg ha^{-1}	40.84	1	42.74	2	44.67	1	45.37	1	43.40	1
New Hydrogel @ 2.5 kg ha^{-1}	40.80	2	42.89	1	44.53	2	45.35	2	43.39	2
MEAN	40.06		42.20		43.93		44.82		42.75	
CD (0.05)	Irrigation levels(A)			Hydrogel(B)			B within A		A within B	
	0.67			**0.24**			**NS**		**NS**	

Two-year data resulted that application of Pusa Hydrogel @ 2.5 kg ha-1 and New Hydrogel @ 2.5 kg ha-1 were at par and yielded better than without hydrogel. The hydrogel with two irrigations and no hydrogel with three irrigations were at par and so we can save one irrigation water with the use of hydrogel to produce the same level of yield.

SPL-4 Performance of promising barley varieties under different Nutrient Management System (NHZ)

The trial was conducted at Bajaura and Malan with three nutrient combinations and five varieties and resulted that application of FYM 5t/ha + NPK @ 30:40:30 kg ha^{-1} is significantly superior to NPK @ 60:40:30 kg ha^{-1} and FYM alone @ 10 t ha^{-1}. The varieties HBL 113 and BHS 400 were at par and significantly superior to other varieties at all nutrient combinations.

Table 8 NHZ POOLED 2019-20

SPL-4 Nutrient Management x Varieties

Varieties	Nutrient Management							
	FYM 10t/ha		FYM 5t/ha + NPK: 30:40:30		NPK: 60:40:30		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
	Yield, q/ha							
BHS 400	30.16	2	42.01	2	39.23	1	37.13	2
BHS 352	24.98	5	35.41	5	32.07	5	30.82	5
HBL 113	30.99	1	43.04	1	38.94	2	37.66	1
HBL 713	27.05	4	37.08	3	33.23	4	32.45	4
VLB 118	28.10	3	36.91	4	33.37	3	32.79	3
MEAN	28.26		38.89		35.37		34.17	
CD (0.05)	Nutrient Management (A)		Varieties (B)		B within A		A within B	
	1.28		2.77		NS		NS	

			Earhead/ m^2					
BHS 400	342.2	1	390.3	2	387.2	2	373.2	2
BHS 352	274.7	5	314.7	5	308.2	5	299.2	5
HBL 113	323.5	3	428.8	1	417.7	1	390.0	1
HBL 713	336.5	2	369.2	3	351.3	4	352.3	3
VLB 118	303.8	4	364.0	4	353.8	3	340.6	4
MEAN	316.1		373.4		363.6		351.1	
CD (0.05)	Nutrient Management (A)		Varieties (B)		B within A		A within B	
	15.6		21.8		37.8		NS	
			Grains/Earhead					
BHS 400	24.36	3	29.52	1	26.95	2	26.94	2
BHS 352	24.39	2	27.18	4	25.88	4	25.81	4
HBL 113	25.66	1	28.64	2	27.32	1	27.20	1
HBL 713	23.99	5	27.95	3	26.88	3	26.27	3
VLB 118	24.03	4	25.96	5	25.62	5	25.21	5
MEAN	24.49		27.85		26.53		26.29	
CD (0.05)	Nutrient Management (A)		Varieties (B)		B within A		A within B	
	1.21		NS		NS		NS	
			1000 Grain Weight, g					
BHS 400	38.43	5	43.00	1	41.34	2	40.93	2
BHS 352	38.66	4	41.63	3	40.00	4	40.10	4
HBL 113	38.92	3	39.77	5	39.65	5	39.45	5
HBL 713	38.93	2	41.31	4	40.61	3	40.28	3
VLB 118	41.78	1	42.76	2	42.70	1	42.41	1
MEAN	39.34		41.69		40.86		40.63	
CD (0.05)	Nutrient Management (A)		Varieties (B)		B within A		A within B	
	1.34		1.15		NS		NS	

Centres: Bajaura and Malan

			Yield, q/ha (Two year data)					
BHS 400	30.75	2	41.97	1	38.98	1	37.23	1
BHS 352	24.31	5	33.91	5	30.47	5	29.56	5
HBL 113	30.90	1	40.91	2	37.16	2	36.32	2
HBL 713	26.70	4	36.18	4	32.12	4	31.67	4
VLB 118	27.64	3	36.67	3	33.07	3	32.46	3
MEAN	28.06		37.93		34.36		33.45	
CD (0.05)	Nutrient Management (A)		Varieties (B)		B within A		A within B	
	1.26		0.57		NS		NS	

Two-year data resulted that the application of FYM @ 5t ha-1 + NPK @ 30:40:30 kg ha-1 recorded a significantly higher grain yield as compared to application of NPK @ 60:40:30 kg ha-1 and FYM @ 10 t ha-1 alone. The varieties HBL 113 and BHS 400 were at par and significantly superior to other varieties at all nutrient combinations.

SPL-5 Effect of Zn application on quality and productivity of barley in different zones (NWPZ, NEPZ, CZ and NHZ)

The trial was conducted in all the zones in split plot design having Zn application (6 treatments) in main plot and variety (two) in sub plot. Zinc treatment incudes control, soil application, foliar application (0.5% zinc sulphate) and soil and foliar application.

In NWPZ, the trial was conducted at Agra, Durgapura, Ludhiana, Hisar, Karnal. Soil application with zinc sulphate @ 25 kg/ha was found superior compared to all soil and foliar application. It produced 14.6 percent more yield compared to no zinc application.

In NEPZ, the trial was conducted at Faizabad, Kanpur and Varanasi. Soil application with zinc sulphate @ 25 kg/ha followed by foliar application (0.5% zinc sulphate) at heading and early milk stage was found superior compared to all other treatments. It produced 14.0 percent more yield compared to no zinc application.

In CZ, the trial was conducted at Udaipur. Soil application with Zinc sulphate @ 25 kg/ha followed by foliar application at heading and early milk stage was found superior compared to all other treatments. It produced 24.5 percent more yield compared to no zinc application.

In NHZ, the trial was conducted at Bajaura and Malan. Soil application with zinc sulphate @ 25 kg/ha and zinc sulphate @ 25 kg/ha followed by foliar application at heading and early milk stage were at par and superior to other treatments. Soil application with Zinc sulphate @ 25 kg/ha recorded 12.6 percent more yield compared to no zinc application.

Table 9 **NWPZ** **Pooled** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk	Yld.	Rk	Yld.	Rk.	Yld.	Rk	Yld.	Rk	Yld.	Rk.	Yld.	Rk
Yield, q/ha														
BH946	45.3	2	50.8	1	53.0	2	44.1	2	50.3	2	50.3	2	49.0	2
DWRB123	47.4	1	50.0	2	53.1	1	47.0	1	51.4	1	51.9	1	50.1	1
Mean	46.3		50.4		53.1		45.6		50.8		51.1		49.5	
CD (0.05)	Zn (A)		1.49		Variety(B)		0.88		B within A				A within B	
Earhead/ m^2														
BH946	356	2	367	2	376	2	371	2	383	2	386	2	373	2
DWRB123	397	1	403	1	411	1	405	1	421	1	429	1	411	1
Mean	377		385		394		388		401		408		392	
CD(0.05)	Zn (A)		10.7		Variety(B)		4.71		B within A				A within B	
Grains/Earhead														
BH946	45.5	1	46.8	1	45.9	1	42.3	1	43.9	1	44.5	1	44.8	1
DWRB123	28.3	2	29.4	2	29.5	2	27.0	2	26.6	2	27.0	2	28.0	2
Mean	36.9		38.1		37.7		34.6		35.2		35.7		36.4	
CD (0.05)	Zn (A)		1.22		Variety(B)		0.65		B within A				A within B	
1000 Grain Weight, g														
BH946	42.3	2	45.7	2	46.9	2	47.3	2	48.6	2	46.9	2	46.3	2
DWRB123	51.3	1	53.7	1	53.7	1	56.6	1	55.4	1	57.3	1	54.7	1
Mean	46.8		49.7		50.3		51.9		52.0		52.1		50.5	
CD (0.05)	Zn (A)		2.30		Variety(B)		1.34		B within A				A within B	
Centres	Agra, Durgapura, Ludhiana, Hisar, Karnal													

Table 10 **NEPZ** **Pooled** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk	Yld.	Rk.	Yld.	Rk.	Yld.	Rk	Yld.	Rk.	Yld.	Rk.	Yld.	Rk
Yield, q/ha														
DWRB137	38.6	1	40.2	1	39.7	2	41.6	1	40.4	2	43.0	1	40.6	1
HUB113	36.6	2	38.6	2	39.9	1	39.5	2	40.9	1	42.7	2	39.7	2
Mean	37.6		39.4		39.8		40.5		40.7		42.9		40.2	
CD(0.05)	Zn (A)		1.77		Variety(B)		NS		B within A				A within B	
Earhead/ m^2														
DWRB137	313	2	319	2	322	2	330	2	329	2	334	2	325	2
HUB113	364	1	364	1	366	1	353	1	351	1	373	1	362	1
Mean	339		342		344		342		340		354		343	
CD (0.05)	Zn (A)		NS		Variety(B)		5.92		B within A		14.5		A within B	14.1
Grains/Earhead														
DWRB137	35.9	1	37.1	1	38.0	1	38.0	1	37.3	1	40.0	1	37.7	1
HUB113	30.7	2	33.3	2	33.3	2	34.9	2	36.8	2	36.9	2	34.3	2
Mean	33.3		35.2		35.7		36.5		37.1		38.5		36.0	
CD (0.05)	Zn (A)		1.70		Variety(B)		1.07		B within A				A within B	
1000 Grain Weight, g														
DWRB137	38.2	1	39.9	1	40.0	2	41.5	1	43.6	1	43.4	1	41.1	1
HUB113	36.9	2	37.2	2	40.1	1	39.7	2	40.5	2	41.2	2	39.3	2
Mean	37.5		38.5		40.1		40.6		42.0		42.3		40.2	
CD (0.05)	Zn (A)		0.95		Variety(B)		0.62		B within A				A within B	
Centres	Faizabad, Kanpur and Varanasi													

Table 11 **CZ** **Udaipur** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method													
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA		Mean	
	Yld.	Rk	Yld.	Rk	Yld.	Rk.	Yld.	Rk	Yld.	Rk.	Yld.	Rk.	Yld.	Rk
Yield, q/ha														
DWRB137	41.9	2	45.8	2	48.7	1	48.9	2	52.7	1	52.8	2	48.5	2
RD2899	43.4	1	47.6	1	48.4	2	50.0	1	52.7	1	53.6	1	49.3	1
Mean	42.7		46.7		48.6		49.4		52.7		53.2		48.9	
CD(0.05)	Zn (A)		4.73		Variety(B)		2.81		B within A				A within B	
Earhead/ m^2														
DWRB137	312	2	317	2	319	2	320	2	326	2	327	2	321	2
RD2899	401	1	406	1	408	1	409	1	415	1	416	1	409	1
Mean	357		362		364		365		371		372		365	
CD 0.05)	Zn (A)		NS		Variety(B)		3.93		B within A		14.5		A within B	14.1
Grains/Earhead														
DWRB137	37.3	2	38.3	2	38.0	2	38.3	2	39.7	2	40.7	2	38.7	2
RD2899	39.3	1	40.7	1	41.7	1	41.7	1	42.7	1	42.7	1	41.4	1
Mean	38.3		39.5		39.8		40.0		41.2		41.7		40.1	
CD 0.05)	Zn (A)		2.20		Variety(B)		1.90		B within A				A within B	
1000 Grain Weight, g														
DWRB137	43.1	2	43.1	2	43.6	2	43.6	2	44.7	2	45.0	2	43.9	2
RD2899	44.6	1	44.9	1	45.2	1	45.4	1	45.4	1	45.9	1	45.2	1
Mean	43.9		44.0		44.4		44.5		45.1		45.4		44.6	
CD 0.05)	Zn (A)		1.22		Variety(B)		0.86		B within A				A within B	
Centres	Udaipur													

Table 12 **NHZ** **Pooled** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ ha		Two spray (Foliar)		12.5kg/ha+2 FA		25.0kg/ha+2 FA			
	Yld.	Rk	Yld.	Rk	Yld.	Rk	Yld.	Rk.	Yld.	Rk	Yld.	Rk	Yld.	Rk
Yield, q/ha														
BHS400	36.4	1	38.7	1	40.8	1	38.4	1	40.0	1	42.1	1	39.4	1
VLB118	33.3	2	36.3	2	37.5	2	35.6	2	38.2	2	39.8	2	36.8	2
Mean	34.8		37.5		39.2		37.0		39.1		40.9		38.1	
CD 0.05)	Variety(B)													
	Zn (A)		2.45			0.45	B within A			A within B				
Earhead/ m^2														
BHS400	331	1	372	1	380	1	386	1	379	1	394	1	374	1
VLB118	301	2	321	2	325	2	324	2	323	2	339	2	322	2
Mean	316		346		353		355		351		367		348	
CD 0.05)	Zn (A)		17.8		Variety(B)		9.45	B within A			A within B			
Grains/Earhead														
BHS400	27.7	1	28.1	1	29.8	1	28.3	1	28.4	1	29.2	1	28.6	1
VLB118	25.0	2	26.1	2	27.3	2	26.9	2	26.6	2	27.8	2	26.6	2
Mean	26.3		27.1		28.6		27.6		27.5		28.5		27.6	
CD 0.05)	Zn (A)		0.99		Variety(B)		0.72	B within A			A within B			
1000 Grain Weight, g														
BHS400	42.5	2	43.3	2	43.4	2	43.7	2	44.0	2	44.6	2	43.6	2
VLB118	43.9	1	44.6	1	45.5	1	44.8	1	45.5	1	45.6	1	45.0	1
Mean	43.2		43.9		44.5		44.2		44.7		45.1		44.3	
CD 0.05)	Zn (A)		1.12		Variety(B)		0.60	B within A			A within B			
Centres	Bajaura and Malan													

Annexure I

Centre wise Yield Tables

Table 2.1 **NORTH WESTERN PLAINS ZONE** **Agra** **2019-20**

IR-TS-Malt-N levels X Variety

Varieties	Nitrogen Levels, kg/ha						Mean	
	60		90		120			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, kg/ha					
DWRB182	39.11	6	44.93	6	46.81	6	43.62	6
DWRB101(c)	46.01	3	51.88	3	52.75	3	50.21	3
RD2849(c)	47.11	2	53.07	2	55.34	2	51.84	2
DWRB123(c)	45.22	5	50.16	5	51.66	5	49.01	5
DWRB160(I)	45.42	4	50.45	4	52.16	4	49.34	4
BH 946(c)	52.57	1	57.85	1	59.25	1	56.56	1
MEAN	45.91		51.39		52.99		50.10	

	F. Test	S.E.m	C.D.	C.V.(%)
Nitrozen levels (A)	**	0.18	0.72	1.56
Varieties (B)	**	0.76	2.15	4.55
B within A	N.S.	1.32	3.73	
A within B		1.22	3.45	
Date of Sowing:	23.11.19	Date of Harvesting:	03.04.20	

Table 2.2 **NORTH WESTERN PLAINS ZONE** **Durgapura** **2019-20**

IR-TS-Malt-N levels X Variety

Varieties	Nitrogen Levels, kg/ha						Mean	
	60		90		120			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, kg/ha					
DWRB182	42.38	6	50.83	6	51.17	6	48.13	6
DWRB101(c)	50.45	2	53.94	4	51.73	5	52.04	4
RD2849(c)	46.97	3	54.99	3	56.11	2	52.69	3
DWRB123(c)	46.27	5	52.95	5	54.34	4	51.19	5
DWRB160(I)	46.37	4	57.80	2	55.46	3	53.21	2
BH 946(c)	53.33	1	59.00	1	63.33	1	58.56	1
MEAN	47.63		54.92		55.36		52.64	

	F. Test	S.E.m	C.D.	C.V.(%)
Nitrozen levels (A)	**	0.93	3.63	7.46
Varieties (B)	**	0.87	2.46	4.94
B within A	N.S.	1.50	4.26	
A within B		1.65	4.69	
Date of Sowing:	16-11-19	Date of Harvesting:	28-03-20	

Table 2.3 **NORTH WESTERN PLAINS ZONE** **Hisar** **2019-20**
IR-TS-Malt-N levels X Variety

Varieties	Nitrogen Levels, kg/ha							
	60		90		120		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, kg/ha					
DWRB182	45.63	2	45.37	5	45.57	6	45.52	5
DWRB101(c)	41.54	5	49.67	2	48.55	4	46.58	3
RD2849(c)	47.09	1	47.02	3	51.98	2	48.70	2
DWRB123(c)	39.68	6	43.45	6	46.16	5	43.10	6
DWRB160(I)	43.25	4	45.57	4	49.80	3	46.21	4
BH 946(c)	45.50	3	52.12	1	52.78	1	50.13	1
MEAN	43.78		47.20		49.14		46.71	

	F. Test	S.E.m	C.D.	C.V.(%)
Nitrozen levels (A)	*	0.74	2.89	6.69
Varieties (B)	**	0.69	1.95	4.42
B within A	**	1.19	3.38	
A within B		1.31	3.73	

Date of Sowing:21.11.19 Date of Harvesting: 06.04.20

Table 2.4 **NORTH WESTERN PLAINS ZONE** **Ludhiana** **2019-20**
IR-TS-Malt-N levels X Variety

Varieties	Nitrogen Levels, kg/ha							
	60		90		120		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, kg/ha					
DWRB182	51.39	1	51.92	2	52.89	1	52.06	1
DWRB101(c)	45.69	3	46.94	4	46.94	5	46.53	4
RD2849(c)	42.5	5	44.17	6	42.22	6	42.96	6
DWRB123(c)	46.94	2	53.75	1	47.50	4	49.40	2
DWRB160(I)	33.19	6	46.39	5	51.67	3	43.75	5
BH 946(c)	44.03	4	51.11	3	52.75	2	49.30	3
MEAN	43.96		49.05		49.00		47.33	

	F. Test	S.E.m	C.D.	C.V.(%)
Nitrozen levels (A)	**	0.18	0.72	1.56
Varieties (B)	**	0.76	2.15	4.55
B within A	N.S.	1.32	3.73	
A within B		1.22	3.45	

Date of Sowing:03.11.19 Date of Harvesting:

Table 2.5 **NORTH WESTERN PLAINS ZONE** **Karnal** **2019-20**

IR-TS-Malt-N levels X Variety

Varieties	Nitrogen Levels, kg/ha						Mean	
	60		90		120			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, kg/ha					
DWRB182	33.82	6	41.02	6	36.07	6	36.97	6
DWRB101(c)	36.92	5	45.13	3	42.85	4	41.63	5
RD2849(c)	43.69	2	44.55	4	41.64	5	43.30	3
DWRB123(c)	41.64	3	45.86	2	43.52	3	43.68	2
DWRB160(I)	43.87	1	50.59	1	44.90	1	46.45	1
BH 946(c)	38.22	4	44.40	5	43.79	2	42.14	4
MEAN	39.69		45.26		42.13		42.36	

	F. Test	S.E.m	C.D.	C.V.(%)
N levels (A)	**	0.41	1.62	4.14
Varieties (B)	**	0.98	2.77	6.91
B within A	N.S.	1.69	4.79	
A within B		1.60	4.53	

Date of Sowing:12.11.19 Date of Harvesting: 08.04.20

Table 3.1 **NHZ** **Bajaura** **2019-20**

SPL-1 Tillage x Varieties

Varieties	Tillage Practices						Mean	
	ZT		CT		T+Residue@6 tha^{-1}			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
				Yield, q/ha				
VLB 118	45.80	1	50.23	2	49.68	2	48.57	2
BHS 400	43.98	3	52.69	1	53.56	1	50.08	1
HBL 112	44.09	2	49.85	3	45.74	3	46.56	3
BHS 352	26.01	5	32.73	4	32.82	4	30.52	4
HBL 276	26.19	4	30.42	5	30.50	5	29.04	5
MEAN	37.21		43.18		42.46		40.95	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	N.S.	1.397	5.48	13.2
Varieties	(B)	**	1.448	4.23	10.6
B within A		N.S.	2.508	7.32	
A within B			2.642	7.71	

Table 3.2 **NHZ** **Malan** **2019-20**

SPL-1 Tillage x Varieties

Varieties	Tillage Practices						Mean	
	ZT		CT		ZT+Residue@6 tha^{-1}			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
				Yield, q/ha				
VLB 118	19.31	2	24.25	2	24.01	2	22.52	2
BHS 400	26.73	1	34.12	1	30.73	1	30.54	1
HBL 112	19.04	3	20.44	4	19.46	3	19.64	3
BHS 352	12.17	5	20.91	3	16.53	5	16.54	5
HBL 276	16.07	4	19.45	5	17.80	4	17.77	4
MEAN	18.66		23.84		21.71		21.40	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	**	0.55	2.18	10.0
Varieties	(B)	**	0.61	1.78	8.56
B within A		N.S.	1.06	3.09	
A within B			1.10	3.20	

Table 4.1 **NWPZ** **Agra** **2019-20**

SPL-2 Irrigation x Varieties

Varieties	**Irrigation**									
	No irrigation		One		Two		Three		Mean	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
RD 946	36.19	1	41.62	1	45.67	1	48.84	1	43.08	1
DWRB 160	33.77	2	37.51	2	41.13	2	43.21	2	38.90	2
MEAN	34.98		39.56		43.40		46.02		40.99	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	0.25	0.87	1.50
Varieties (B)	**	0.45	1.45	3.77
B within A	N.S.	0.89	2.91	
A within B		0.68	2.21	

Table 4.2 **NWPZ** **Hisar** **2019-20**

SPL-2 Irrigation x Varieties

Varieties	**Irrigation**									
	No irrigation		One		Two		Three		Mean	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
RD 946	34.21	1	43.73	1	46.41	2	48.84	2	43.30	1
DWRB 160	32.32	2	42.21	2	47.28	1	50.14	1	42.99	2
MEAN	33.261		42.97		46.85		49.49		43.14	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	1.01	3.51	5.76
Varieties (B)	N.S.	0.58	1.89	4.66
B within A	N.S.	1.16	3.78	
A within B		1.30	4.25	

Table 4.3 **NWPZ** **Ludhiana** **2019-20**

SPL-2 Irrigation x Varieties

Varieties	Irrigation									
	No irrigation		One		Two		Three		Mean	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
RD 946	39.86	1	49.44	2	52.92	2	53.19	2	48.85	2
DWRB 160	38.06	2	52.08	1	54.31	1	54.01	1	49.61	1
MEAN	38.96		50.76		53.61		53.60		49.23	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	*	2.76	9.56	13.7
Varieties (B)	N.S.	1.60	5.22	11.3
B within A	N.S.	3.20	10.4	
A within B		3.57	11.6	

Table 4.4 **NWPZ** **Karnal** **2019-20**

SPL-2 Irrigation x Varieties

Varieties	**Irrigation**									
	No irrigation		One		Two		Three		Mean	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
RD 946	56.02	2	57.47	1	55.68	2	56.26	1	56.36	1
DWRB 160	56.53	1	55.54	2	56.27	1	55.27	2	55.90	2
MEAN	56.27		56.50		55.97		55.77		56.13	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	N.S.	0.75	2.59	3.26
Varieties (B)	N.S.	0.62	2.02	3.82
B within A	N.S.	1.24	4.04	
A within B		1.15	3.76	

Table 5.1 **NEPZ** **Faizabad** **2019-20**

SPL-2 Irrigation x Varieties

Varieties	**Irrigation**									
	No irrigation		**One**		**Two**		**Three**		**Mean**	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
DWRB 137	26.69	2	35.24	1	38.95	2	39.42	2	35.07	2
HUB 113	28.00	1	34.85	2	39.36	1	39.87	1	35.52	1
MEAN	27.34		35.05		39.15		39.64		35.30	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	1.53	5.28	10. 6
Varieties (B)	N.S.	0.70	2.28	6.86
B within A	N.S.	1.40	4.56	
A within B		1.82	5.93	

Table 5.2 **NEPZ** **Kanpur** **2019-20**

SPL-2 Irrigation x Varieties

Hydrogel	**Irrigation**									
	No irrigation		**One**		**Two**		**Three**		**Mean**	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
DWRB 137	38.40	2	41.30	2	45.30	2	48.50	2	43.37	2
HUB 113	40.30	1	44.20	1	47.20	1	50.70	1	45.60	1
MEAN	39.35		42.75		46.25		49.6		44.49	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	0.54	1.88	2.99
Varieties (B)	**	0.22	0.73	1.75
B within A	N.S.	0.45	1.47	
A within B		0.63	2.05	

Table 5.3 **NEPZ** **Varanasi** **2019-20**

SPL-2 Irrigation x Varieties

Varieties	**Irrigation**									
	No irrigation		**One**		**Two**		**Three**		**Mean**	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
DWRB 137	21.76	1	33.32	1	36.72	1	41.48	1	33.32	1
HUB 113	19.38	2	24.82	2	29.58	2	35.36	2	27.28	2
MEAN	20.57		29.07		33.15		38.42		30.30	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	0.74	2.57	6.00
Varieties (B)	**	0.55	1.79	6.26
B within A	N.S.	1.09	3.57	
A within B		1.07	3.50	

Table 7.1 **NWPZ** **Agra** **2019-20**

SPL-3 Irrigation x Hydrogel

Hydrogel	**Irrigation numbers**									
	No irrigation		**One**		**Two**		**Three**		**Mean**	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
Control	19.03	3	39.47	3	45.84	3	46.50	3	37.71	3
Pusa Hydrogel@ 2.5 kg ha^{-1}	25.55	2	45.78	2	48.75	2	50.96	2	42.76	2
New Hydrogel @ 2.5 kg ha^{-1}	29.40	1	47.80	1	50.82	1	52.72	1	45.18	1
MEAN	24.66		44.35		48.47		50.06		41.88	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	0.43	1.47	3.05
Hydrogel (B)	**	0.40	1.21	3.34
B within A	N.S.	0.81	2.42	
A within B		0.78	2.35	

Table 7.2 **NWPZ** **Hisar** **2019-20**

SPL-3 Irrigation x Hydrogel

Hydrogel	**Irrigation numbers**									
	No irrigation		**One**		**Two**		**Three**		**Mean**	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
Control	31.01	3	41.15	3	46.02	3	50.60	2	42.19	3
Pusa Hydrogel@ 2.5 kg ha^{-1}	32.04	1	43.48	2	47.86	2	49.13	3	43.12	2
New Hydrogel @ 2.5 kg ha^{-1}	31.86	2	45.08	1	48.73	1	51.03	1	44.17	1
MEAN	31.63		43.24		47.54		50.25		43.16	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	0.84	2.92	5.86
Hydrogel (B)	*	0.51	1.53	4.10
B within A	N.S.	1.02	3.06	
A within B		1.18	3.55	

Table 7.3 **NWPZ** **Durgapura** **2019-20**

SPL-3 Irrigation x Hydrogel

Hydrogel	**Irrigation numbers**									
	No irrigation		**One**		**Two**		**Three**		**Mean**	
	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk	Yield	Rk
Control	15.23	3	24.13	3	33.20	3	39.67	3	28.06	3
Pusa Hydrogel@ 2.5 kg ha^{-1}	20.17	1	30.33	1	39.73	1	45.33	1	33.89	1
New Hydrogel @ 2.5 kg ha^{-1}	18.73	2	27.83	2	37.33	2	44.00	2	31.97	2
MEAN	18.04		27.43		36.76		43.00		31.31	

	F. Test	S.E.m	C.D.	C.V.(%)
Irrigation (A)	**	0.93	3.20	8.87
Hydrogel (B)	**	0.75	2.25	8.30
B within A	N.S.	1.50	4.50	
A within B		1.54	4.60	

Table 8.1 **SPL-4 Nutrient X Varieties NHZ** **Bajaura** **2019-20**

Varieties	Nutrient Management: FYM 10t/ha		FYM 5t/ha + NPK: 30:40:30		NPK: 60:40:30		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, Q/ha					
BHS 400	32.27	2	48.01	2	43.98	2	41.42	2
BHS 352	24.03	5	34.86	5	32.96	5	30.62	5
HBL 113	32.78	1	49.63	1	44.67	1	42.36	1
HBL 713	30.10	4	42.09	4	38.66	4	36.95	4
VLB 118	31.62	3	45.56	3	41.80	3	39.66	3
MEAN	30.16		44.03		40.41		38.20	

		F. Test	S.E.m	C.D.	C.V. (%)
Nutrient	(A)	**	0.44	1.72	4.44
Varieties	(B)	**	1.49	4.35	11.7
B within A		N.S.	2.58	7.54	
A within B			2.35	6.86	

Table 8.2 **SPL-4 Nutrient X Varieties NHZ** **Malan** **2019-20**

Varieties	Nutrient Management: FYM 10t/ha		FYM 5t/ha + NPK: 30:40:30		NPK: 60:40:30		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
			Yield, Q/ha					
BHS 400	28.05	2	36.01	2	34.48	1	32.85	2
BHS 352	25.93	3	35.96	3	31.18	3	31.03	3
HBL 113	29.19	1	36.45	1	33.20	2	32.95	1
HBL 713	24.00	5	32.06	4	27.81	4	27.96	4
VLB 118	24.58	4	28.26	5	24.93	5	25.92	5
MEAN	26.35		33.75		30.32		30.14	

		F. Test	S.E. m	C.D.	C.V.(%)
Nutrient	(A)	**	0.21	0.82	2.67
Varieties	(B)	**	0.341	1.00	3.42
B within A		**	0.591	1.74	
A within B			0.571	1.67	

Table 9.1 **NWPZ** **Agra** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
							Yield, q/ha							
BH946	38.7	1	46.7	1	51.3	1	44.3	1	56.7	1	58.8	1	49.4	1
DWRB 123	36.3	2	44.3	2	50.9	2	41.8	2	52.5	2	54.7	2	46.7	2
Mean	37.5		45.5		51.1		43.1		54.6		56.8		48.1	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	**	0.99	3.12	5.04
Varieties	(B)	**	0.448	1.376	3.93
B within A		N.S.	1.09	3.36	
A within B			1.25	3.87	

Table 9.2 **NWPZ** **Durgapura** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
							Yield, q/ha							
BH946	51.5	2	58.9	1	57.6	2	42.0	2	48.9	1	47.8	2	51.1	2
DWRB 123	55.7	1	54.3	2	60.7	1	45.7	1	45.3	2	49.6	1	51.9	1
Mean	53.6		56.6		59.1		43.9		47.1		48.7		51.5	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	**	1.07	3.38	5.09
Varieties	(B)	N.S.	0.50	1.55	4.15
B within A		*	1.23	3.81	
A within B			1.38	4.26	

Table 9.3 **NWPZ** **Hisar** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
							Yield, q/ha							
BH946	42.3	2	43.3	2	43.3	2	41.7	2	42.0	2	43.7	2	42.7	2
DWRB 123	45.2	1	46.0	1	45.2	1	46.5	1	48.2	1	47.7	1	46.5	1
Mean	43.7		44.7		44.2		44.1		45.1		45.7		44.6	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	N.S.	0.90	2.84	4.94
Varieties	(B)	**	0.63	1.96	6.04
B within A		N.S.	1.55	4.79	
A within B			1.42	4.38	

Table 9.4 **NWPZ** **Karnal** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
							Yield, q/ha							
BH946	54.5	2	55.4	1	59.1	1	49.7	2	53.2	2	48.1	2	53.3	2
DWRB 123	56.2	1	53.7	2	53.9	2	55.4	1	58.8	1	51.7	1	54.9	1
Mean	55.4		54.5		56.5		52.5		56.0		49.9		54.1	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	N.S.	1.52	4.79	6.88
Varieties	(B)	N.S.	1.06	3.28	8.35
B within A		N.S.	2.61	8.04	
A within B			2.39	7.37	

Table 9.5 **NWPZ** **Ludhiana** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
	Yield, q/ha													
BH946	39.3	2	49.7	2	53.69	2	42.8	2	50.5	2	53.2	2	48.2	2
DWRB 123	43.4	1	51.5	1	55.0	1	45.5	1	52.0	1	56.0	1	50.6	1
Mean	41.4		50.6		54.35		44.1		51.2		54.6		49.4	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	**	1.26	3.98	6.26
Varieties	(B)	*	0.65	2.02	5.63
B within A		N.S.	1.61	4.95	
A within B			1.70	5.23	

Table 10.1 **NEPZ** **Faizabad** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
	Yield, q/ha													
DWRB 137	35.1	2	36.4	1	38.1	2	37.5	1	38.5	1	40.0	1	37.6	1
HUB113	35.5	1	36.2	2	38.2	1	37.2	2	38.1	2	39.5	2	37.5	2
Mean	35.3		36.3		38.1		37.4		38.3		39.8		37.5	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	N.S.	0.89	2.81	5.81
Varieties	(B)	N.S.	1.23	3.80	13.9
B within A		N.S.	3.02	9.30	
A within B			2.31	7.13	

Table 10.2 **NEPZ** **Kanpur** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method													
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha														
DWRB137	48.4	2	49.6	2	50.5	2	51.5	2	51.1	2	51.7	2	50.5	2
HUB113	50.5	1	52.3	1	55.3	1	56.2	1	57.5	1	60.1	1	55.3	1
Mean	49.4		51.0		52.9		53.8		54.3		55.9		52.9	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	**	0.381	1.20	1.76
Varieties	(B)	**	0.20	0.61	1.59
B within A		**	0.49	1.50	
A within B			0.51	1.58	

Table 10.3 **NEPZ** **Varanasi** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method													
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA		Mean	
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha														
DWRB137	32.3	1	34.7	1	30.6	1	35.7	1	31.6	1	37.4	1	33.7	1
HUB113	23.8	2	27.2	2	26.2	2	25.2	2	27.2	2	28.6	2	26.4	2
Mean	28.0		30.9		28.4		30.4		29.4		33.0		30.0	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	N.S.	1.57	4.94	12.8
Varieties	(B)	**	1.01	3.11	14.3
B within A		N.S.	2.47	7.63	
A within B			2.35	7.24	

Table 12.1 **NHZ** **Malan** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha														
BHS400	26.4	1	29.4	1	32.4	1	29.8	1	30.4	1	34.2	1	30.4	1
VLB 118	23.7	2	26.8	2	28.6	2	26.3	2	28.0	2	31.2	2	27.4	2
MEAN	25.1		28.1		30.5		28.1		29.2		32.7		28.9	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	**	0.36	1.15	3.10
Varieties	(B)	**	0.13	0.42	1.99
B within A		N.S.	0.33	1.02	
A within B			0.43	1.34	

Table 12.2 **NHZ** **Bajaura** **2019-20**

SPL 5 Zn Application x Varieties

Varieties	Zinc application dose, source and method												Mean	
	No Zinc		12.5 kg/ha		25.0kg/ha		Two spray (Foliar)		12.5kg/ha+ 2 FA		25.0kg/ha+ 2 FA			
	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.	Yld.	Rk.
Yield, q/ha														
BHS400	46.3	1	48.0	1	49.2	1	47.0	1	49.6	1	50.0	1	48.4	1
VLB 118	42.9	2	45.8	2	46.5	2	44.9	2	48.3	2	48.4	2	46.1	2
MEAN	44.6		46.9		47.8		46.0		49.0		49.2		47.3	

		F. Test	S.E.m	C.D.	C.V.(%)
Tillage	(A)	N.S.	1.62	5.10	8.38
Varieties	(B)	*	0.542	1.67	4.88
B within A		N.S.	1.332	4.10	
A within B			1.872	5.77	

SOIL PHYSICO-CHEMICAL PROPERTIES

SOIL PROPERTY	Locations										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
	Malan	**Bajaura**	**Agra**	**Durgapura**	**Hisar**	**Ludhiana**	**Karnal**	**Kanpur**	**Varanasi**	**Faizabad**	**Udaipur**
SOIL GROUP	SILTY CLAY LOAM	SILTY LOAM	Sandy loam	LOAMY SAND	Sandy loam	Loamy sand	Clay loam	Sandy Loam	Sandy clay loam	Sandy loam	Clay-loam
SAND, (%)	-	28.2	59.30	84.00	72	83.6		55	49.6	-	38.75
SILT, (%)	-	53.4	21.25	7.35	18.5	7.9		32	28.25	-	26.78
CLAY , (%)	-	18.4	19.12	6.80	9.5	8.4		14	22.15	-	34.47
BULK DENSITY, Mg m^{-3}	1.52	1.54		1.47	1.4	1.44		-	1.4	-	1.46
FIELD CAPACITY,(%)	31	-	18.39	10.40				-	19.5	-	
PERMANENT WILTING POINT,(%)	14	-	9.47	3.10				-	5.55	-	
ORGANIC CARBON, (%)	0.60	0.64	0.33	0.22	0.38	0.32	0.35	0.40	0.45	-	0.55
AVAILABLE N, Kg ha^{-1}	454	368	180.8	172	142	-	-	-	202.03	-	289.52
AVAILABLE P_2O_5,kg ha^{-1}	44	25.5	28.34	32.60	17.3	32	17.2	18	22.02	-	25.85
AVAILABLE K_2O,kg ha^{-1}	226	174	281.6	231	292	215.2	221	180	228.13	-	367.15
PH (1:2)	5.3	6.2	8.11	8.2	7.8	7.9	8.1	7.5	7.42	-	7.87
EC(1:2)	1.58	0.55	1.80	0.25	0.21	0.15	0.28	0.15	0.15	-	0.9

Meteorological Information

Bajaura Lattitude 31º 48' N Longitude 77 º 00' E Height above MSL 1090 m								**Malan Latitude 32º 1' N Longitude 76 º 2' E Height above MSL 950 m**							
Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine	Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm			Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)								40 (01-07 Oct.)							
41 (08-14 Oct.)								41 (08-14 Oct.)							
42 (15-21 Oct.)								42 (15-21 Oct.)							
43 (22-28 Oct)								43 (22-28 Oct)							
44 (29-04 Nov.)	26.6	7.3	94	56	8.2			44 (29-04 Nov.)							
45 (05-11 Nov.)	23.1	4.9	93	57	35.4			45 (05-11 Nov.)	15.2	25.5	71.3	81	8.4		
46 (12-18 Nov.)	20.6	5.9	90	46	0.0			46 (12-18 Nov.)	12.8	22.5	70.3	76.4	-		
47 (19-25 Nov.)	19.4	4.4	92	63	7.4			47 (19-25 Nov.)	13	23.4	69.4	75.4	-		
48 (26-02 Dec.)	17.8	2.6	92	55	10.4			48 (26-02 Dec.)	13.5	22.9	65.1	74.9	-		
49 (03-09 Dec.)	20.8	-2.6	91	39	0.0			49 (03-09 Dec.)	10.7	23.6	65	70.9	-		
50 (10-16 Dec.)	14	0.8	93	62	40.6			50 (10-16 Dec.)	6.5	22.9	66.6	72	79.6		
51 (17-23 Dec)	15.7	-1	92	50	1.8			51 (17-23 Dec)	5.2	23.4	68.9	71.1	-		
52 (24-31 Dec)	18.1	-3.8	88	40	0.0			52 (24-31 Dec)	4.8	23.8	67.9	73.9	-		
1 (01-07 Jan)	12.1	1.1	91	63	26.4			1 (01-07 Jan)	5.8	22.8	66.1	70.7	43.6		
2 (8-14 Jan)	9.9	1.3	92	71	68.3			2 (8-14 Jan)	5.9	22.7	70	73.3	34.4		
3 (15-21 Jan)	14.6	1.8	91	47	8.0			3 (15-21 Jan)	5.8	23.5	64.7	75	-		
4 (22-28 Jan)	17	0.8	90	37	1.0			4 (22-28 Jan)	5.6	23.9	69.9	77	42.2		
5 (29-04 Feb.)	15.3	-1.1	91	36	24.5			5 (29-04 Feb.)	5.7	24.1	70.9	76	-		
6 (05-11 Feb.)	19.2	-1.3	92	30	0.0			6 (05-11 Feb.)	6.8	25.8	65.9	71.9	-		
7 (12-18 Feb.)	23.1	1.9	90	27	0.0			7 (12-18 Feb.)	6.5	26.5	74.4	78.4	-		
8 (19-25 Feb.)	21.7	3	89	33	0.0			8 (19-25 Feb.)	6.5	25.3	71.3	74.6	6.2		
9 (26-04 Mar.)	21.4	3.1	89	33	11.2			9 (26-04 Mar.)	7.4	24.6	72.1	78.4	14.7		
10 (05-11 Mar.)	21.3	3.9	92	39	30.1			10 (05-11 Mar.)	6.6	23.7	70.9	77	172.9		
11 (12-18 Mar.)	19.8	4.1	93	42	38.2			11 (12-18 Mar.)	7.9	26.1	71	77	36.5		
12 (19-25 Mar.)	23.9	5	89	36	14.2			12 (19-25 Mar.)	11.3	27.9	68.6	73.4	-		
13 (26-01 Apr.)	21.3	3.9	92	39	30.1			13 (26-01 Apr.)	11.9	28.8	69.9	77.7	-		
14 (02-08 Apr.)	24.7	4.9	91	35	6.4			14 (02-08 Apr.)	14.2	31	70.4	74.7	-		
15 (09-15 Apr.)	27.4	7.6	84	36	2.4			15 (09-15 Apr.)	16.2	32.5	72.9	78.4	8.2		
16 (16-22 Apr.)	23	7.9	78	49	56.7			16 (16-22 Apr.)	16.3	32.8	66.7	72.4	-		
17 (23-29 April)	26.1	9.8	73	41	15.4			17 (23-29 April)	15.7	31.8	70.1	75	6.4		
18(30-06 May)								18(30-06 May)	32.4	16.2	77	73.1	18.4		
19 (8-14 May, 19)								19 (8-14 May, 19)	31.4	16.4	81.6	74.1	21.7		
20 (15-21 May, 19)								20 (15-21 May, 19)							
21 (22-28 May, 19)								21 (22-28 May, 19)							

Agra Latitude 27º02' N Longitude 77 º 09' E Height above MSL 163.4 m								Udaipur Latitude 24º35' N Longitude 73 º 42' E Height above MSL 582.17 m							
Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine	Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm			Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	32.9	22.4	89.6	71.6	14.3	2.6		40 (01-07 Oct.)	30.16	18.61	89.14	68.00	66.40	4.61	3.23
41 (08-14 Oct.)	33.9	21.1	80.7	56.6	-	3.1		41 (08-14 Oct.)	31.53	16.30	85.57	62.14	18.40	5.06	2.20
42 (15-21 Oct.)	33.0	20.6	83.7	56.7	-	1.8		42 (15-21 Oct.)	31.96	16.14	80.14	46.29	0.00	4.46	2.47
43 (22-28 Oct)	37.7	17.8	80.6	50.1	-	2.6		43 (22-28 Oct)	29.06	13.24	80.57	38.14	0.00	3.49	3.14
44 (29-04 Nov.)	30.8	18.7	83.8	50.8	-	1.8		44 (29-04 Nov.)	29.51	17.16	86.14	52.00	12.40	3.43	2.51
45 (05-11 Nov.)	29.3	16.6	89.0	51.4	-	1.7		45 (05-11 Nov.)	28.99	16.84	83.29	47.00	0.00	3.56	3.11
46 (12-18 Nov.)	28.7	16.7	87.4	50.9	-	1.7		46 (12-18 Nov.)	28.53	13.33	84.57	40.71	0.00	3.00	2.59
47 (19-25 Nov.)	27.3	13.8	90.0	57.1	-	1.9		47 (19-25 Nov.)	27.49	11.81	82.86	48.86	0.00	2.47	1.59
48 (26-02 Dec.)	25.2	14.8	95.7	69.7	7.1	1.6		48 (26-02 Dec.)	26.26	13.34	88.86	56.43	0.00	2.71	2.94
49 (03-09 Dec.)	23.6	9.9	89.7	67.1	-	1.4		49 (03-09 Dec.)	23.96	8.06	86.14	31.43	0.00	2.17	2.41
50 (10-16 Dec.)	20.4	11.8	92.8	80.6	13.0	1.1		50 (10-16 Dec.)	24.27	7.51	88.00	37.71	0.00	2.80	3.14
51 (17-23 Dec)	17.5	8.0	94.3	86.6	-	1.0		51 (17-23 Dec)	23.47	6.57	82.43	40.14	0.00	2.10	2.59
52 (24-31 Dec)	13.3	4.9	94.6	86.3	-	1.0		52 (24-31 Dec)	21.50	4.68	82.63	40.13	0.00	2.21	2.39
1 (01-07 Jan)	20.4	8.1	89.4	84.1	-	1.0		1 (01-07 Jan)	21.19	6.81	86.71	49.29	0.00	2.19	2.74
2 (8-14 Jan)	19.1	8.2	96.3	72.1	-	1.0		2 (8-14 Jan)	22.06	5.24	81.71	40.43	0.00	4.54	3.16
3 (15-21 Jan)	17.3	8.3	92.7	87.1	24.2	1.0		3 (15-21 Jan)	21.03	6.43	86.43	42.00	0.00	2.37	2.30
4 (22-28 Jan)	21.1	8.0	87.0	63.1	-	1.7		4 (22-28 Jan)	24.71	7.94	82.71	31.29	0.00	3.26	2.71
5 (29-04 Feb.)	21.0	7.8	87.4	64.6	-	1.4		5 (29-04 Feb.)	22.29	4.51	85.00	36.29	0.00	2.67	2.96
6 (05-11 Feb.)	22.5	7.9	87.1	64.6	-	1.8		6 (05-11 Feb.)	23.01	4.44	80.29	34.43	0.00	3.07	2.61
7 (12-18 Feb.)	27.9	10.6	83.0	51.4	-	1.3		7 (12-18 Feb.)	28.54	7.66	77.43	21.86	0.00	3.79	2.33
8 (19-25 Feb.)	26.5	13.2	86.0	65.4	-	1.8		8 (19-25 Feb.)	28.09	9.00	76.29	28.86	0.00	4.47	2.94
9 (26-04 Mar.)	28.9	15.2	90.4	63.6	11.0	3.1		9 (26-04 Mar.)	30.15	10.91	73.38	26.63	0.00	4.50	2.35
10 (05-11 Mar.)	25.1	13.6	91.3	72.7	17.6	3.1		10 (05-11 Mar.)	26.61	10.19	71.86	33.33	3.00	7.13	5.06
11 (12-18 Mar.)	27.4	14.9	90.1	63.0	2.3	2.3		11 (12-18 Mar.)	26.86	8.57	62.71	22.57	0.00	5.26	4.31
12 (19-25 Mar.)	31.6	16.4	90.9	50.4	-	3.0		12 (19-25 Mar.)	33.00	14.51	54.67	29.00	0.00	4.25	2.27
13 (26-01 Apr.)	31.5	17.3	80.1	53.4	60.2	4.1		13 (26-01 Apr.)	30.50	13.75	80.00	24.30	7.40	5.90	3.90
14 (02-08 Apr.)	35.1	18.4	90.7	38.9	-	5.3		14 (02-08 Apr.)	34.71	14.61	54.29	19.00	0.00	6.81	3.03
15 (09-15 Apr.)	37.8	20.4	80.4	30.3	-	5.9		15 (09-15 Apr.)	37.27	17.61	58.29	14.57	0.00	8.17	3.06
16 (16-22 Apr.)	37.7	22.7	88.6	31.0	-	6.3		16 (16-22 Apr.)	37.29	19.81	50.29	23.57	0.00	9.86	5.61
17 (23-29 April)	36.0	22.4	87.7	30.4	54.3	5.1		17 (23-29 April)	36.17	19.57	49.33	18.67	0.00	8.00	4.03
18(30-06 May)	37.9	23.1	84.8	39.9	3.6	5.0		18(30-06 May)							
19(07-13 May)	39.5	23.2	85.1	37.7	-	4.7									
20(14-20 May)	40.7	25.5	72.4	39.3	-	7.0									

Kanpur Latitude 25^0 28' N Longitude 80^o 34' E Height above MSL 125.9 m								Faizabad Latitude 26^o 47' N Longitude 82^o 12' E Height above MSL 113 m							
Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine	Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm			Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)								40 (01-07 Oct.)	30.9	22.4	94.3	70.9	10.0	4.4	1.7
41 (08-14 Oct.)	22.2	33.2	41.4	83.8	00			41 (08-14 Oct.)	32.6	20.9	89.1	59.1	0.0	4.6	1.2
42 (15-21 Oct.)	20.9	31.6	31.6	51.1	00			42 (15-21 Oct.)	31.7	21.1	93.7	61.9	0.0	5.0	0.9
43 (22-28 Oct)	17.2	30.3	44.2	87.2	00			43 (22-28 Oct)	29.0	17.4	90.3	61.7	0.0	4.1	2.0
44 (29-04 Nov.)	18.0	31.0	45.8	90.8	00			44 (29-04 Nov.)	29.4	16.9	93.4	64.3	0.0	3.4	0.9
45 (05-11 Nov.)	16.9	29.8	41.4	85.5	00			45 (05-11 Nov.)	29.9	15.6	93.7	54.4	0.0	3.3	1.9
46 (12-18 Nov.)	13.8	29.2	38.2	89.5	00			46 (12-18 Nov.)	29.3	13.1	92.7	70.6	0.0	3.3	1.9
47 (19-25 Nov.)	13.2	26.8	38.0	61.8	00			47 (19-25 Nov.)	27.0	12.5	91.9	59.1	0.0	3.1	2.3
48 (26-02 Dec.)	14.6	26.2	59.1	87.0	00			48 (26-02 Dec.)	27.0	14.2	93.6	61.6	0.0	3.2	1.7
49 (03-09 Dec.)	10.3	24.0	44.5	92.1	00			49 (03-09 Dec.)	24.8	9.7	94.3	47.3	0.0	6.3	1.8
50 (10-16 Dec.)	11.8	21.9	67.1	94.2	10			50 (10-16 Dec.)	22.8	11.2	91.7	57.1	22.0	4.1	3.4
51 (17-23 Dec)	9.1	17.5	63.8	86.2	00			51 (17-23 Dec)	17.1	8.5	91.7	73.9	0.0	2.7	3.9
52 (24-31 Dec)	5.3	13.3	71.0	90.7	00			52 (24-31 Dec)	10.8	5.2	89.9	80.3	0.0	2.0	3.5
1 (01-07 Jan)	7.1	15.2	70.0	93.7	7.6			1 (01-07 Jan)	19.9	9.1	88.7	62.7	7.8	2.2	3.3
2 (8-14 Jan)	8.8	18.4	64.7	91.4	3.0			2 (8-14 Jan)	16.4	8.3	93.4	77.4	6.6	2.0	3.6
3 (15-21 Jan)	10.8	17.4	78.1	95.1	65.5			3 (15-21 Jan)	18.5	10.3	95.4	76.9	21.0	2.4	3.3
4 (22-28 Jan)	6.7	17.9	52.4	91.2	00			4 (22-28 Jan)	21.0	6.4	90.3	66.3	0.0	3.0	3.5
5 (29-04 Feb.)	10.8	21.9	46.7	86.5	00			5 (29-04 Feb.)	21.9	7.4	91.4	57.1	0.0	3.5	4.4
6 (05-11 Feb.)	6.7	21.1	46.5	92.0	00			6 (05-11 Feb.)	22.5	6.2	92.3	48.6	0.0	3.3	6.6
7 (12-18 Feb.)	9.5	23.2	42.7	80.5	00			7 (12-18 Feb.)	24.9	9.6	85.6	49.3	0.0	3.7	5.4
8 (19-25 Feb.)	12.6	25.3	50.2	81.7	1.8			8 (19-25 Feb.)	25.6	12.4	91.7	62.3	53.0	3.4	4.4
9 (26-04 Mar.)	14.4	26.1	56.0	89.6	2.1			9 (26-04 Mar.)	26.8	13.9	92.4	53.3	0.0	3.5	2.2
10 (05-11 Mar.)	15.0	26.5	54.2	86.2	22.6			10 (05-11 Mar.)	26.0	13.9	88.9	59.1	68.0	3.7	5.4
11 (12-18 Mar.)	14.1	25.0	59.7	86.5	5.0			11 (12-18 Mar.)	27.1	14.7	87.3	57.4	9.0	3.8	3.4
12 (19-25 Mar.)	15.6	29.5	40.0	80.7	00			12 (19-25 Mar.)	29.7	15.7	86.4	50.6	2.0	4.9	2.6
13 (26-01 Apr.)	18.4	30.8	41.4	75.8	6.0			13 (26-01 Apr.)	32.1	16.6	75.9	32.7	0.0	5.3	6.4
14 (02-08 Apr.)	16.2	34.1	20.0	62.5	00			14 (02-08 Apr.)	34.8	16.1	69.7	22.4	0.0	6.4	4.9
15 (09-15 Apr.)	18.7	37.6	17.8	57.8	00			15 (09-15 Apr.)	36.9	18.7	70.9	30	0.0	6.5	3.3
16 (16-22 Apr.)	21.6	38.1	27.2	63.0	3.4			16 (16-22 Apr.)	36.6	21.5	76.7	35.3	1.0	6.5	4.2
17 (23-29 April)	21.9	35.0	37.4	66.8	28.4			17 (23-29 April)	33.4	22.0	80.9	48.3	0.0	5.5	5.1
18(30-06 May)								18(30-06 May)	32.6	21.1	86.3	52.3	0.0	5.4	4.8

Hisar Latitude 29º10' N Longitude 75º 46' E Height above MSL 215.2 m								**Durgapura** Lattitude 26º **51' N Longitude 75º 47' E Height above MSL 390 m**							
Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine	Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm			Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	31.8	21.0	92	50	2.6	3.7	5.5	40 (01-07 Oct.)	32.1	21.6	77	51	0.0	3.9	8.5
41 (08-14 Oct.)	32.7	17.6	90	38	0.0	3.9	7.5	41 (08-14 Oct.)	32.6	18.2	70	34	18.0	4.1	8.9
42 (15-21 Oct.)	34.1	18.4	79	34	0.0	4.0	7.3	42 (15-21 Oct.)	34.0	20.1	54	30	0.0	5	8.5
43 (22-28 Oct)	31.9	15.0	79	31	0.0	3.1	6.5	43 (22-28 Oct)	32.0	16.3	60	23	0.0	3.9	5.9
44 (29-04 Nov.)	30.7	16.3	90	40	0.0	1.8	1.8	44 (29-04 Nov.)	32.0	18.3	63	31	0.0	3.7	3.7
45 (05-11 Nov.)	28.4	12.7	85	36	0.3	2.8	6.6	45 (05-11 Nov.)	29.0	15.1	65	33	0.0	3.2	7.2
46 (12-18 Nov.)	26.8	12.7	87	40	0.0	2.0	3.0	46 (12-18 Nov.)	29.3	17.9	56	33	0.0	3.2	6.7
47 (19-25 Nov.)	26.7	10.9	87	45	0.0	2.3	5.0	47 (19-25 Nov.)	27.3	14.0	65	36	0.0	3.2	5.5
48 (26-02 Dec.)	22.6	12.1	94	63	12.0	1.5	2.8	48 (26-02 Dec.)	25.0	15.4	71	50	0.0	2.8	3.5
49 (03-09 Dec.)	23.1	6.0	88	47	0.0	1.3	6.2	49 (03-09 Dec.)	24.1	7.9	74	28	0.0	2.3	7.6
50 (10-16 Dec.)	19.2	8.3	95	73	4.5	1.2	2.2	50 (10-16 Dec.)	21.9	8.3	82	42	3.0	1.7	5.6
51 (17-23 Dec)	13.7	6.1	99	81	0.0	0.9	1.1	51 (17-23 Dec)	20.2	5.6	84	37	0.0	1.8	7.7
52 (24-31 Dec)	11.9	2.6	97	75	0.0	0.8	1.7	52 (24-31 Dec)	19.8	2.7	88	34	0.0	1.4	8.3
1 (01-07 Jan)	17.3	5.7	96	60	0.0	1.0	3.5	1 (01-07 Jan)	19.9	8.6	70	44	0.0	2	6.7
2 (8-14 Jan)	17.7	5.7	96	64	3.2	1.0	3.3	2 (8-14 Jan)	19.8	7.2	71	38	0.0	1.9	7.2
3 (15-21 Jan)	13.4	4.7	100	82	0.0	0.5	2.1	3 (15-21 Jan)	20.1	9.4	79	45	0.0	1.7	5.4
4 (22-28 Jan)	19.2	5.0	96	56	7.2	1.4	5.9	4 (22-28 Jan)	22.6	8.0	69	29	0.0	2.5	8.6
5 (29-04 Feb.)	18.8	3.9	98	61	0.0	1.3	6.3	5 (29-04 Feb.)	23.0	8.1	62	28	0.0	2.6	7.7
6 (05-11 Feb.)	20.1	2.8	92	46	0.0	1.7	7.2	6 (05-11 Feb.)	22.4	9.0	68	26	0.0	2.3	8.3
7 (12-18 Feb.)	24.7	4.8	36	16	0.0	0.0	2.2	7 (12-18 Feb.)	27.3	10.0	57	17	0.0	4.1	8.9
8 (19-25 Feb.)	23.8	10.5	61	7	10.9	1.6	2.6	8 (19-25 Feb.)	27.3	13.3	70	35	0.0	3.9	6.5
9 (26-04 Mar.)	25.8	12.2	55	7	0.2	0.0	2.3	9 (26-04 Mar.)	28.7	17.3	64	36	1.0	4.4	7.8
10 (05-11 Mar.)	23.5	11.2	64	12	61.8	8.8	2.8	10 (05-11 Mar.)	25.2	12.9	66	43	12.6	2.8	7.4
11 (12-18 Mar.)	23.5	10.5	56	8	11.6	1.7	2.6	11 (12-18 Mar.)	26.4	12.8	55	38	0.0	4	8.4
12 (19-25 Mar.)	28.8	13.8	92	50	0.0	3.3	6.8	12 (19-25 Mar.)	32.0	19.2	58	27	5.4	5.3	5.7
13 (26-01 Apr.)	27.9	15.2	92	55	21.6	4.0	5.4	13 (26-01 Apr.)	30.9	17.9	67	30	6.2	5.5	5.5
14 (02-08 Apr.)	30.6	13.4	84	42	0.5	4.0	7.4	14 (02-08 Apr.)	34.2	19.8	37	16	0.0	7.6	10.2
15 (09-15 Apr.)	33.9	16.4	76	26	0.0	4.8	7.4	15 (09-15 Apr.)	37.3	23.0	34	13	0.0	10.0	10.0
16 (16-22 Apr.)	36.9	19.6	67	24	0.8	6.3	7.5	16 (16-22 Apr.)	35.9	23.2	36	20	0.0	10.2	7.3
17 (23-29 April)	34.3	19.7	75	41	4.0	5.3	7.8	17 (23-29 April)	35.6	21.5	58	29	10.4	7.5	9.3
18(30-06 May)	37.4	22.1	69	32	18.2	7.0	8.8	18(30-06 May)	38.4	24.4	49	26	7.8	7.8	9.3

Karnal Latitude 29º 43' N Longitude 76 º 58' E Height above MSL 245								Ludhiana Latitude 30º56' N Longitude 75º 52' E Height above MSL 247 m							
Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine	Julian weeks	Temperature,C		RH %		Rainfall	Pan Evap.	Sun Shine
	Max.	Min.	Max.	Min.	mm	mm	hrs/day		Max.	Min.	Max.	Min.	mm	mm	hrs/day
40 (01-07 Oct.)	30.3	20.9	94.9	76.3	2		6.71	40 (01-07 Oct.)							
41 (08-14 Oct.)	31.9	18.4	95.6	78.1			4.84	41 (08-14 Oct.)							
42 (15-21 Oct.)	32.0	18.7	97.3	70.1			6.64	42 (15-21 Oct.)							
43 (22-28 Oct)	30.8	16.4	94.1	66.4			7.54	43 (22-28 Oct)	30.5	15.8	88.0	40.0	0.0	15.0	6.3
44 (29-04 Nov.)	30.2	16.9	96.1	69.9			6.81	44 (29-04 Nov.)	29.0	16.2	94.0	46.0	0.0	12.6	1.2
45 (05-11 Nov.)	28.4	14.9	97.4	66.3			5.84	45 (05-11 Nov.)	27.4	13.6	82.0	38.0	0.0	16.0	4.9
46 (12-18 Nov.)	27.2	12.8	98.1	54.7			6.99	46 (12-18 Nov.)	25.1	13.6	93.0	48.0	0.0	12.6	4.1
47 (19-25 Nov.)	26.7	11.5	99.4	57.0			4.26	47 (19-25 Nov.)	24.8	11.2	92.0	42.0	0.0	11.4	5.1
48 (26-02 Dec.)	23.9	12.6	96.3	51.3	15		6.93	48 (26-02 Dec.)	22.4	12.0	92.0	58.0	35.2	12.6	5.0
49 (03-09 Dec.)	22.5	7.1	99.7	54.1			3.13	49 (03-09 Dec.)	22.4	7.2	94.0	43.0	0.0	8.6	6.2
50 (10-16 Dec.)	19.9	9.5	92.7	51.6	24.2		4.46	50 (10-16 Dec.)	16.2	9.4	95.0	69.0	46.8	7.6	2.3
51 (17-23 Dec)	14.3	7.8	94.0	49.7			4.59	51 (17-23 Dec)	13.6	8.1	94.0	74.0	0.0	6.7	0.9
52 (24-31 Dec)	10.6	5.8	95.4	45.7			6.84	52 (24-31 Dec)	10.3	5.4	89.0	75.0	46.8	4.8	0.9
1 (01-07 Jan)	16.4	3.9	93.4	59.6			4.46	1 (01-07 Jan)	16.3	5.7	93.0	63.0	13.4	3.8	2.8
2 (8-14 Jan)	15.1	8.0	99.6	51.1	42		7.00	2 (8-14 Jan)	15.1	7.1	93.0	69.0	20.0	5.7	4.1
3 (15-21 Jan)	15.3	7.5	97.0	67.9	10.6		4.41	3 (15-21 Jan)	16.1	7.4	93.0	67.0	0.0	5.0	3.8
4 (22-28 Jan)	15.7	5.9	98.6	84.6			1.56	4 (22-28 Jan)	18.3	6.2	93.0	55.0	6.4	8.4	6.3
5 (29-04 Feb.)	16.4	6.5	98.7	83.7	21.8		0.31	5 (29-04 Feb.)	17.5	5.7	95.0	59.0	0.0	10.0	7.2
6 (05-11 Feb.)	18.2	3.9	99.6	60.4			5.16	6 (05-11 Feb.)	18.9	4.9	94.0	49.0	71.0	11.0	7.9
7 (12-18 Feb.)	21.5	7.4	96.1	78.6			3.16	7 (12-18 Feb.)	23.0	7.8	93.0	45.0	0.0	14.4	9.7
8 (19-25 Feb.)	23.0	10.2	99.3	84.0	21.4		3.43	8 (19-25 Feb.)	23.4	12.0	85.0	51.0	6.0	18.0	6.9
9 (26-04 Mar.)	23.8	11.4	98.7	70.4	1.1		4.26	9 (26-04 Mar.)	24.8	13.1	93.0	53.0	0.0	19.6	6.2
10 (05-11 Mar.)	23.5	10.9	100.0	78.9	74.2		4.49	10 (05-11 Mar.)	21.1	10.8	88.0	61.0	29.4	18.4	5.7
11 (12-18 Mar.)	23.5	11.2	100.0	59.3	61.6		7.34	11 (12-18 Mar.)	23.3	11.8	87.0	55.0	17.8	14.0	8.6
12 (19-25 Mar.)	26.5	12.8	94.0	56.4			8.51	12 (19-25 Mar.)	27.5	14.6	87.0	50.0	3.0	19.4	6.8
13 (26-01 Apr.)	27.7	15.0	96.1	58.0	24.8		6.83	13 (26-01 Apr.)	26.2	15.3	90.0	53.0	18.8	20.4	6.4
14 (02-08 Apr.)	29.8	13.4	97.6	67.5			6.30	14 (02-08 Apr.)	29.1	14.4	81.0	37.0	0.0	27.6	10.1
15 (09-15 Apr.)	34.0	15.2	93.0	69.1			6.19	15 (09-15 Apr.)	35.5	18.4	71.0	21.0	0.0	34.5	9.6
16 (16-22 Apr.)	36.4	19.5	96.3	62.6	17.2		6.91	16 (16-22 Apr.)	32.9	18.1	70.0	37.0	9.8	32.4	9.1
17 (23-29 April)	33.0	18.2	96.4	56.9	8.4		7.87	17 (23-29 April)	35.5	19.7	66.0	37.0	3.4	34.8	9.3
18(30-06 May)								18(30-06 May)	35.3	21.8	68.0	35.0	16.2	41.2	8.5
								19(07-13 May)	35.6	21.7	61.0	33.0	5.4	40.0	8.9

Cooperating centers and Scientists

Sr No.	Cooperating Centers	Scientists Involved
NORTHERN HILL ZONE		
1.	Almora	Dr. Dibakar Mahanta, Scientist Agronomy, VPKAS, Almora-263 601 (Uttarakhand).
2.	Palampur/ Malan	Dr AD Bindra, Principal, Scientist (Agronomy), CSK HPKV Rice-wheat Research Centre, , Malan, District Kangra, HP.
3.	Bajaura	Dr Gurudev Singh, Assistant Agronomist, CSKHPKV, HAREC, Bajaura-175 125 (HP).
4.	Shimla	Dr D P Walia/ Dr Madhu Patial, Principal Scientist, IARI RS, Tutikandi, Shimla-171 004, Himachal Pradesh.
NORTH WESTERN PLAIN ZONE		
5.	Karnal	Dr Ajit Singh Kharub, Principal Scientist, PB NO. 158, DWR, Karnal -132 001
6.	Ludhiana	Dr Hari Ram Saharan, Sr. Agronomist, Deptt. of Agronomy, PAU Ludhiana - 141 004
7.	Agra	Dr SB Singh, Head, Department of Agronomy, RBS College, Bichpuri, Agra, UP-283105.
8.	Hisar	Dr. Bhagat Singh, Barley Agronomist, Department of Plant Breeding, CCS HAU, Hisar (Haryana)-125 004
9.	Durgapura	Dr MR Yadav, Agronomist, RARI, Durgapura, Jaipur (Rajasthan)
NORTH EASTERN PLAINS ZONE		
10.	Kanpur	Dr. RA Yadav, Asstt. Agronomist, Section of EB (Rabi Cereals), CSAUA&T, Kanpur (UP)- 208 002
11.	Varanasi	Dr RK Singh, Sr. agronomist (AICWIP), Institute of Agricultural Sciences, BHU, Varanasi (UP)- 221 005
12.	Ayodhya	Dr. Ashok Kumar Singh, Wheat & barley Agronomist, Department of Agronomy, NDUA&T, Kumarganj, Ayodhya (UP)- 224 229
CENTRAL ZONE		
13.	Udaipur	Dr Jagdish Choudhary, Assitt. Professor (Agronomy), Department of Agronomy, College of Agriculture, Udaipur, Rajasthan-313 001.

BARLEY QUALITY

MALTING QUALITY EVALUATION

The Barley Improvement Unit took up the malting quality evaluation of grain samples of Advanced Varietal Trial (AVT) and Initial Varietal Trial (IVT) on malt barley received from various test sites at its central facility. The grain samples (500gm) were received from nine locations (Hisar, Karnal, Bawal, Modipuram, Ludhiana, Bathinda, Durgapura and Pantnagar). This year a total of 270 samples were received. There were 17 test entries in IVT (including one entry from private industry) which were analyzed with five checks, in case of AVT, four entries (DWRB182 from AVT-2 Year and DWRB 196, DWRB 197 PL 908 from AVT-1st Year) with five checks were analyzed.

Table-1 Details of grain samples received and analyzed for malting quality

State	Location	Trial	No. of Samples
Haryana	Hisar	AVT/IVT	31
	Karnal	AVT/IVT	31
	Bawal	AVT/IVT	31
Punjab	Ludhiana	AVT/IVT	31
	Bathinda	AVT/ IVT	31
Rajasthan	Durgapura	AVT/IVT	31
	Sri Ganganagar*	IVT	22
Uttar Pradesh	Modipuram	AVT/IVT	31
Uttarakhand	Pantnagar	AVT/IVT	31
Total			**270**

**Data is not being reported because of very late arrival of samples.*

The grain samples were analyzed for different malting quality traits (Table 2).

Table 2. Malting quality traits analyzed

Grain Quality	Malt Quality
- 1000 Grain Weight (g)	- Malt Friability (%)
- Test Weight (kg/hl)	- Malt Homogeneity (%)
- Germinative Energy (at 72 hrs) (%)	- Hot Water extract % (F.g.d.b.)
- Husk Content (%)	- Diastatic Power (^{0}L)
- Protein Content (%)	- Wort Filtration rate (ml/hr)
- B- glucan (%)	- Kolbach Index
- Kernel Plumpness (%)	- Wort pH
- Proportion of bold grain (retained on 2.5 mm and 2.8 mm sieve)	- Saccharification rate (minutes)
- Proportion of thin grain (passed through 2.2 mm sieve)	- Wort β- glucan content (ppm)
- Grain Starch content	- Wort FAN content (ppm)
- Grain Moisture Content	

The samples were first analyzed for physical and biochemical grain parameters important for malting based on the approved guidelines. The different traits (test weight, bold / thin proportion, germinative energy, 1000 grain weight and husk content) were analyzed as per EBC approved procedures. Crude protein content, starch content and moisture content of grains was predicted using FOSS NIR system. The processed grain samples (thin grains removed) were subjected to micro-malting on the "Joe White Micro-Malting System" taking 100 gm sample from each genotype. Micro-malting was done in three phases, which included steeping, germination and kilning. Steeping was done in four stages (wet stage for

8 hours at 25ºC; air rest for 12 hours at 18ºC; wet stage for 6 hours at 18ºC and air rest for 10 hours at 18ºC) in a total duration of 36 hours. Germination was done in three stages (24 hours at 18ºC, 24 hours at 17ºC and 12 hours at 16ºC) in total of 60 hours. Kilning was done in a total of 8 stages for 26 hours starting from 45ºC and increasing 5ºC incrementally after each duration of 3 hours with final temperature of 80ºC except 5 hours at 65ºC to preserve maximum possible enzyme activities.

The Analytical Guidelines for Barley Breeders in India (Annexure-1) approved by the "National Core Group on Malt Barley Development" (NCGMBD) were followed for the minimum standards of physical and biochemical properties of barley grain and malt, for evaluation of new genotypes. The analytical methods of EBC (Analytica EBC, 2003) were followed for determination of various quality parameters. The analysis of diastatic power (D.P.) of malt was done as per the IOB method and expressed in ºLinter value as described in Farzaneh et al. (2017) The impact of germination time on some selected parameters through malting process, International Journal of Biological Macromolecules 94 (2017) 663–668.

The following important points may be considered during interpretation of the results.

- *Protein content, Kolbach inde, Starch content has been estimated using NIR system on dry weight basis. Moisture content in grains was also predicted through NIR.*
- *Grain β- glucan content was done in samples of two locations. Wort β- glucan was done for two locations in AVT and few selected entries in IVT.*
- *Husk content analysis was done by Sodium hypo-chlorite method (dry basis) as per EBC procedure.*
- *The steeping temperature during wet stages has been kept at 25ºC in first stage.*
- *The wort was filtered through Whatman folded filter papers (2555 1/2, (dia 320 mm) to determine filtration rate and subsequent analysis of wort.*
- *The diastatic power was done by the method as described above results should be inferred under this light.*
- *Hot water extract and other malt quality values should be interpreted in the light that only 100g sample was micro-malted for each genotype and each location. This gives a relative picture in comparison to checks only and therefore industrial values for bulk processing, may differ.*
- *The kilning time was 26 hours with additional 2 hours at 65ºC as on the experience of last year it was observed that probably glucanase activity got affected resulting in very high values of wort β-glucan.*

Since the dormancy of grain also affects its performance during malting, the details of malting cycles have been given below:

S. No.	Dates	Locations
1	01.06.2020-06.06.2020	Karnal and Hisar
2	15.06.2020-20.06.2020	Modipuram and Durgapura
3	22.06.2020-27.06.2020	Pantnagar and Ludhiana
4	29.06.2020-04.07.2020	Bawal and Bathinda
5	20.07.2020-25.02.2020	Sri Ganganagar*

**Results not being reported as of now to avoid delay in report publication*

Several genotypes were observed as good source for individual grain and malt quality traits (Table 3), though they may not have good values for remaining traits. The average zonal performance of the AVT and IVT entries for grain and malt quality traits is given in Tables 4(a, b, c & d). The location wise data for each physical and biochemical grain/malt quality parameter are given in Annexure 2a and 2b. The mean values were taken for identifying promising lines based on minimum standards determined by the 'NCGMBD' for malt barley in the country revised time to time with the latest revision on 22.06.2020.

Since many of the grain and malt quality traits are negatively correlated and we have to look for the balanced optimal combination for these traits. There were several entries observed promising for individual traits, after the detailed analysis across locations in the NWP Zone. This was done by the system of scoring giving due weightage to important traits. (Table 6a and 6b). Thus, based on the twelve in AVT/

ten in IVT important traits (a maximum possible score of 36 in AVT & 30 in IVT), entries were identified as promising.

The salient points of this year's results are as below:

- β- glucan content needs to be brought down in new malt varieties and in this regard DWRB 182, DWRB 211 and RD 3025 had β- glucan content of equal or less than 4.5%.
- Higher Diastatic power is another requirement of industry presently, three entries BH 1027, PL 916 and BH 1026 have been identified as good sources of this trait with Linter value of more than 90.
- Very desirable value of wort β-glucan has been obtained in DWRB 211
- In overall malt quality DWRB 182 in AVT-II, DWRB 197 in AVT-I and DWRB 211 were found to be the best genotypes.

Table 3. Promising entries for individual malting quality trait

Traits	Promising entries
1000 grain weight	PL908 (6R), DWRB182
Bold Grains	DWRB 196
Protein content	DWRB182, DWRB 197, BH1026, DWRB212, BH1027, PL916, PL919, PL912, RD3026
Husk Content	DWRB209
Grain B- glucan	DWRB182, RD3025, DWRB211
Malt Friability	DWRB 197, DWRB211, BH1027, PL912, PL919, PL916
Hot water extract	DWRB211, DWRB209, BH1027, RD3024, UPB1090
Filtration Rate	DWRB182, DWRB209, RD3025
Diastatic Power	DWRB 197, PL916, BH1027, BH1026
FAN Content	RD 3025
Wort β- glucan	DWRB 211, BH 3025, DWRB 197, DWRB 182
Over all MQ	**DWRB 182, DWRB 197, DWRB 211, DWRB 209, BH 1027**

Table 4 a. Grain quality of AVT malt barley entries in NWPZ#

S. N.	Genotype	Test wt (kg/hl)	Bold (%)#	Thin (%)	1000GW (g)	GER (%)	Protein (%)	Husk (%)	BG (%)*
1	DWRB182	60.2(57.6-64.5)	86.2(78.5-92.2)	3.1(1.2-5.4)	43.1 (37.3-44.9)	97.9(93-100)	12.4(9.1-15.0)	12.8(11.8-14.2)	4.5
2	DWRB 196	59.9(56.5-66.7)	95.4(93.0-99.7)	1.1(0.5-2.3)	59.5 (48.4-65.4)	98.4(96-100)	10.8(9.4-13.1)	12.7(10.3-14.8)	6.7
3	DWRB 197	62.4(57.8-67.7)	93.8(90.6-98.4)	0.8(0.3-2.1)	49.3 (43.8-54.3)	97.1(84-100)	11.8(10.0-13.5)	12.8(10.1-14.4)	6.6
4	PL908**	56.1(49.9-66.0)	87.3(79.4-92.3)	3.1(1.9-5.8)	43.1 (38.9-48.2)	97.6(94-100)	11.6(8.8-13.6)	12.8(11.4-13.8)	5.2
5	BH902 (C)**	57.2(54.0-62.6)	83.0(62.5-94.4)	4.6(1.5-14.2)	43.1 (34.5-51.0)	98.4(96-100)	10.5(9.1-11.8)	14.7(13.8-15.3)	5.3
6	DWRB 101 (C)	62.6(58.7-67.3)	90.3(79.2-96.5)	1.8(0.0-5.9)	47.0 (42.6-51.9)	97.9(96-100)	11.0(8.6-12.8)	12.3(10.9-13.9)	5.5
7	DWRB123 (C)	63.5(61.4-67.8)	93.8(82.8-98.2)	1.2(0.3-4.3)	52.3 (47.5-59.2)	99.4(97-100)	10.9(7.9-13.7)	13.4(11.5-14.8)	5.7
8	DWRB160 (C)	59.3(55.1-64.2)	95.4(91.7-98.8)	1.2(0.2-2.9)	61.2 (48.7-69.5)	94.5(75-99)	11.0(9.4-13.7)	13.4(11.4-14.7)	6.9
9	RD2849 (C)	63.2(60.2-66.4)	88.1(78.8-93.4)	2.2(0.8-4.1)	46.9 (44.0-50.3)	97.1(84-100)	11.2(8.8-12.6)	12.6(10.6-14.8)	5.0

*# = range in brackets *Mean of two locations only (Karnal & Hisar) **Six row barley*

Table 4 b. Malt quality of AVT malt barley entries in NWPZ#

S. N.	Genotype	Frib (%)	FR (ml/hr)	HWE (%fgdb)	DP (^{0}L)*	KI (%)	FAN (ppm)**	Wort BG (ppm)**
1	DWRB182	65(52-87)	271(230-290)	80.4(78.0-82.2)	80.0(56.2-108.7)	37.0(33.6-41.3)	193	318
2	DWRB 196	63(50-72)	238(180-280)	79.4(73.4-83.1)	75.4(54.9-102.0)	39.3(37.3-42.2)	145	732
3	DWRB 197	72(53-95)	235(210-260)	77.8(67.6-82.1)	80.7(61.0-98.0)	38.3(35.5-42.1)	198	248
4	PL908***	48(28-67)	241(210-270)	79.0(74.5-82.8)	78.7(56.2-100.0)	39.8(36.1-43.5)	183	606
5	BH902 (C)***	58(48-71)	181(130-230)	78.6(71.6-82.8)	80.2(66.2-104.2)	40.0(38.1-42.9)	199	447
6	DWRB 101 (C)	67(50-88)	246(230-270)	79.4(73.0-81.6)	60.7(51.5-68.0)	38.3(36.1-42.7)	222	393
7	DWRB123 (C)	51(40-65)	235(170-260)	80.8(78.0-82.4)	69.1(51.0-88.5)	39.0(36.8-43.6)	172	570
8	DWRB160 (C)	59(45-73)	208(150-240)	79.4(73.8-81.6)	75.1(50.5-99.0)	39.6(36.6-43.5)	168	793
9	RD2849 (C)	64(53-73)	243(220-260)	80.8(79.1-82.3)	64.3(49.0-84.0)	38.5(36.9-40.2)	215	376

*# = range in brackets * Mean of two locations (Karnal and Hisar) **Mean of five locations only (Karnal, Hisar, Bawal, Ludhiana & Pantnagar) ***Six row barley*

Table 4 c. Grain quality of IVT malt barley entries in NWPZ#

S.N.	Genotype	Test wt (kg/hl)	Bold (%)	Thin (%)	1000GW (g)	GER (%)	Protein (%)	Husk (%)	BG (%)*
1	ABI Kranti	60.8(53.7-68.2)	80.3(49.1-97.1)	5.1(0.4-19.7)	39.6(29.0-44.2)	94(78-100)	11.7(8.5-14.8)	12.8(10.2-15.2)	4.4
2	BH1026	61.6(58.2-65.6)	92.4(70.5-98.5)	1.0(0.1-2.2)	56.7(52.0-61.2)	99(97-100)	12.6(10.7-14.1)	12.9(10.3-15.3)	6.5
3	BH1027	62.3(60.1-66.6)	94.6(86.2-98.3)	0.9(0.1-2.2)	54.9(51.1-60.1)	89(35-100)	12.2(10.3-13.9)	13.0(11.4-15.4)	5.9
4	BH1028	58.1(52.3-63.5)	89.7(74.4-97.3)	3.7(0.4-10.0)	57.9(46.6-64.3)	97(89-100)	11.2(9.4-12.6)	12.7(10.2-16.3)	6.2
5	DWRB209	61.0(58.1-65.5)	92.6(82.8-98.1)	2.2(0.4-6.0)	49.7(41.7-56.9)	97(93-100)	11.0(8.5-12.8)	11.5(9.4-15.2)	4.9
6	DWRB210	60.6(52.5-66.7)	94.4(86.9-98.8)	1.2(0.2-2.7)	56.1(48.3-63.7)	94(71-100)	11.7(8.5-13.6)	13.7(12.2-14.9)	5.4
7	DWRB211	62.2(58.8-68.1)	92.6(90.0-96.6)	1.7(0.4-3.2)	54.4(44.5-69.0)	97(93-100)	11.3(9.3-13.0)	14.1(10.1-16.0)	4.5
8	DWRB212	61.3(57.4-65.7)	93.5(89.7-96.4)	1.3(0.3-2.2)	54.5(47.1-69.8)	98(93-100)	12.3(10.5-13.9)	13.0(10.0-15.3)	5.6
9	PL912	61.5(58.4-65.2)	86.4(71.3-96.3)	2.2(0.5-6.4)	54.7(47.5-63.0)	98(92-100)	12.0(9.5-13.7)	12.8(10.4-16.2)	5.6
10	PL916	59.4(53.3-64.2)	75.9(60.3-90.5)	4.7(0.7-7.4)	47.0(42.1-54.7)	97(85-100)	12.2(9.3-15.0)	13.5(11.0-15.5)	5.0
11	PL919	61.8(56.7-69.7)	81.4(74.0-91.4)	3.2(0.9-7.0)	48.9(44.3-54.4)	97(90-100)	12.0(8.9-15.1)	13.8(10.7-15.9)	5.0
12	RD3023	58.0(54.2-62.6)	93.5(86.3-97.5)	1.2(0.4-3.5)	58.2(54.0-66.6)	96(89-100)	11.2(8.7-12.6)	13.0(10.6-15.0)	5.0
13	RD3024	61.3(57.3-64.5)	94.2(84.6-98.7)	1.0(0.2-2.2)	52.2(46.4-58.4)	95(86-100)	11.0(9.5-12.7)	13.0(10.3-14.3)	5.3
14	RD3025	56.2(52.1-63.5)	86.5(73.6-96.0)	3.6(1.1-9.4)	46.6(37.8-52.4)	96(85-100)	11.2(8.8-13.2)	13.5(10.2-15.3)	4.0
15	RD3026	59.0(53.6-66.3)	93.5(84.9-98.3)	1.2(0.3-3.5)	48.4(45.2-52.6)	96(88-100)	11.9(9.3-13.4)	14.3(10.8-16.5)	6.5
16	UPB1089	61.7(58.7-65.6)	89.5(74.7-96.9)	2.6(0.4-8.1)	47.2(37.7-52.6)	97(88-100)	11.2(9.1-12.7)	13.1(9.9-16.1)	6.2
17	UPB1090	61.0(57.8-64.6)	90.8(79.9-97.7)	2.2(0.2-5.6)	57.8(50.6-69.5)	98(91-100)	11.7(9.7-13.0)	13.7(11.6-16.4)	5.5
18	BH946**	55.1(51.2-61.4)	85.3(60.9-95.6)	3.9(0.4-13.0)	40.9(30.5-47.7)	97(87-100)	11.1(10.2-12.3)	15.4(13.2-16.8)	5.2
19	DWRB101(C)	64.0(61.1-68.8)	89.5(82.0-96.1)	1.9(0.4-4.0)	46.9(44.0-52.1)	95(89-99)	11.8(9.8-14.0)	12.1(10.5-13.5)	5.2
20	DWRB123(C)	62.9(59.8-68.1)	90.8(79.2-98.4)	2.0(0.2-7.0)	50.5(42.9-56.6)	97(89-100)	11.5(9.7-13.7)	13.5(12.0-14.8)	5.0
21	DWRB160(C)	59.0(55.5-63.0)	95.3(92.4-99.0)	2.2(0.1-11.2)	63.9(56.9-69.8)	98(96-99)	11.5(9.8-14.1)	14.0(12.9-15.6)	6.7
22	RD2849 (C)	63.7(59.8-67.3)	87.1(80.9-91.6)	2.4(0.8-4.8)	46.1(42.5-47.9)	95(72-100)	11.2(9.0-13.7)	13.0(11.0-14.9)	4.9

**Mean of two locations only (Karnal & Hisar) **Six row barley # = range in brackets*

Table 4 d. Malt quality of IVT malt barley entries in NWPZ#

S.N.	Genotype	Frib (%)	FR (ml/hr)	HWE (%fgdb)	DP (^{0}L)*	KI (%)
1	ABI Kranti	79.1(46.1-92.3)	261(115-310)	80.1(78.6-82.6)	86(60-102)	40(38-46)
2	BH1026	63.7(49.0-76.7)	179(115-250)	79.5(73.5-82.5)	92(85-104)	40(35-44)
3	BH1027	67.6(57.9-81.6)	219(130-290)	81.1(79.1-83.0)	95(78-106)	38(36-42)
4	BH1028	46.4(38.8-65.6)	235(170-270)	79.2(72.1-83.4)	74(62-85)	38(32-42)
5	DWRB209	64.4(48.1-88.1)	260(230-290)	81.1(78.8-82.6)	84(70-99)	38(34-42)
6	DWRB210	61.0(47.3-82.2)	244(200-270)	79.5(76.7-82.1)	83(71-91)	38(36-40)
7	DWRB211	70.8(56.7-94.1)	251(220-290)	82.0(79.4-83.4)	82(58-116)	40(37-42)
8	DWRB212	58.4(36.3-73.1)	209(150-280)	77.8(71.1-81.1)	77(63-106)	39(35-42)
9	PL912	67.3(56.3-76.5)	241(220-280)	78.9(75.8-82.5)	62(52-77)	38(36-41)
10	PL916	66.5(49.5-87.2)	241(170-280)	80.2(76.7-82.5)	95(88-109)	39(38-41)
11	PL919	66.9(38.1-98.8)	245(230-270)	79.4(75.4-82.1)	85(51-103)	39(34-43)
12	RD3023	61.3(43.9-83.5)	239(180-260)	79.2(72.6-82.5)	82(68-99)	40(37-42)
13	RD3024	61.1(48.3-72.9)	234(140-280)	80.8(77.4-83.0)	74(55-87)	39(36-43)
14	RD3025	56.1(33.3-76.7)	254(225-280)	79.7(74.1-83.1)	81(65-91)	39(36-43)
15	RD3026	48.0(23.8-62.9)	226(200-250)	78.3(71.9-81.7)	81(55-93)	39(36-43)
16	UPB1089	61.0(43.8-83.3)	239(160-270)	79.9(76.4-82.7)	76(59-98)	39(32-42)
17	UPB1090	64.1(41.9-86.6)	208(120-270)	80.8(78.2-83.6)	85(76-98)	38(36-40)
18	BH946**	64.8(44.4-99.1)	200(150-240)	78.9(74.6-80.8)	76(54-96)	40(34-42)
19	DWRB101(C)	59.2(47.2-79.6)	253(200-280)	80.5(79.3-81.9)	63(55-77)	38(35-41)
20	DWRB123(C)	53.5(41.3-77.7)	235(150-270)	79.0(75.2-82.3)	70(60-98)	38(36-41)
21	DWRB160(C)	62.6(47.4-80.2)	219(150-240)	79.5(75.7-82.5)	85(71-100)	39(37-43)
22	RD2849 (C)	65.6(46.2-82.1)	249(170-280)	79.9(76.1-82.6)	60(52-76)	39(36-45)

**Mean of five locations only (Karnal, Hisar, Bawal, Ludhiana & Pantnagar) **Six row barley # = range in brackets*

Table 5 a. Weighted performances of AVT entries for malting quality (Timely sown)

S.N.	Genotype	TW	Bol	Pro	Husk	BG	Fria	FR	HW	DP	KI	WBG	FAN	Total (36)
1	DWRB182	0	1	3	0	2	1	3	3	1	1	2	3	**20**
2	DWRB 196	0	3	2	0	0	1	2	2	1	2	0	2	**15**
3	DWRB 197	1	3	2	0	0	3	2	1	2	2	3	3	**22**
4	PL908*	0	3	2	0	0	0	2	3	1	3	0	3	**17**
5	BH902 (C)*	0	3	2	0	0	0	1	3	1	3	0	3	**16**
6	DWRB 101 (C)	1	3	2	1	0	2	2	2	0	2	1	3	**19**
7	DWRB123 (C)	2	3	2	0	0	0	2	3	0	2	0	3	**17**
8	DWRB160 (C)	0	3	2	0	0	0	2	2	1	3	0	3	**16**
9	RD2849 (C)	2	2	2	0	1	1	2	3	0	2	1	3	**19**

*= six- row barleys

Score range

HW	(Two Row) <61=0, 61.0- 63.0=1, 63.1-65.0=2, >65.0=3 (Six Row) <60=0, 60.0- 62.0=1, 62.1-64.0=2, >64.0=3
Bold	(Two-Row) >90.0=3, 88.0-90.0=2, 86.0-87.9=1, <86.0=0 (Six-row) = >80.0= 3, 78.0-80.0=2, 76.0-77.9=1, <76=0
Husk	<10.5=3, 10.5-11.5=2, 11.6-12.5=1, >12.5=0
Protein	<10.0=1, 10.0-12.0=2, 12.1-13.0=3, 13.1-14.0=2, >14.0=1
B. glucan	<3.5=3, 3.5 - 4.5=2, 4.6-5.0=1, >5.0=0
Friability	>70=3, 66-70=2, 60-65.9=1, <60=0
HWE	Two-row= >80.0=3, 78.6-80.0=2, 77.0-78.5=1, <77.0=0 Six-row = >78.5=3, 76.6-78.5=2, 74.5-76.5=1, <74.5=0
FR	>250=3, 201-250=2, 150-200=1, <150=0
DP	>90=3, 81-90=2, 70-80=1, <70=0
KI	40-45 = 3, 38-39 & 46-48=2, 35-37=1, <35 & >48=0
WBG	<300=3, 301-350=2, 351-400=1, >400=0
FAN	>150=3, 126-150=2, 100-125=1, <100=0

HW= Hectolitre Weight/Test weight, Bold= Bold grain , Husk= Husk (%), Protein= Protein % dwb, HWE= Hot water extract (%), FR= Filtration rate (ml/hr), DP= Diastatic power (^{0}L), B Glucan= B- glucan, KI= Kolbach index (%), WBG=Wort Beta Glucan, FAN=Free Amino Nitrogen

Table 5 b. Weighted performances of IVT entries for malting quality

S. No	Genotype	TW	Bol	Pro	Husk	BG	Fria	FR	HW	DP	KI	Total (30)
1	ABI Kranti	1	0	2	0	2	3	3	3	2	3	**19**
2	BH1026	1	3	3	0	0	1	1	2	3	3	**17**
3	BH1027	1	3	3	0	0	2	2	3	3	2	**19**
4	BH1028	0	2	2	0	0	0	2	2	1	2	**11**
5	DWRB209	1	3	2	2	1	1	3	3	2	2	**20**
6	DWRB210	1	3	2	0	0	1	2	2	2	2	**15**
7	DWRB211	1	3	2	0	2	3	3	3	2	3	**22**
8	DWRB212	1	3	3	0	0	0	2	1	1	2	**13**
9	PL912	1	1	2	0	0	2	2	2	0	2	**12**
10	PL916	0	0	3	0	1	2	2	3	3	2	**16**
11	PL919	1	0	2	0	1	2	2	2	2	2	**14**
12	RD3023	0	3	2	0	1	1	2	2	2	3	**16**
13	RD3024	1	3	2	0	0	1	2	3	1	2	**15**
14	RD3025	0	1	2	0	2	0	3	2	2	2	**14**
15	RD3026	0	3	2	0	0	0	2	1	2	2	**12**
16	UPB1089	1	2	2	0	0	1	2	2	1	2	**13**
17	UPB1090	1	3	2	0	0	1	2	3	2	2	**16**
18	BH946*	0	3	2	0	0	1	1	3	1	3	**14**
19	DWRB101(C)	2	2	2	1	0	0	3	3	0	2	**15**
20	DWRB123(C)	1	3	2	0	1	0	2	2	1	2	**14**
21	DWRB160(C)	0	3	2	0	0	1	2	2	2	2	**14**
22	RD2849 (C)	2	1	2	0	1	1	2	2	0	2	**13**

*= six- row barleys *Please refer to Score range given below table no 5a on page no 5.7*

HW= Hectolitre Weight/Test weight, Bold= Bold grain , Husk= Husk (%), Protein= Protein % dwb, HWE= Hot water extract (%), FR= Filtration rate (ml/hr), DP= Diastatic power (^{0}L), B Glucan= B- glucan, KI= Kolbach index (%), WBG=Wort Beta Glucan, FAN=Free Amino Nitrogen

Annexure - 1

ANALYTICAL GUIDELINES FOR BARLEY BREEDERS IN INDIA (Revised on 22.06.2020)

Parameters		**Desirable Values**			
GRAIN PARAMETERS					
		Two Row		**Six Row**	
SN	***Parameter***	***Existing***	***Revised***	***Existing***	***Revised***
1	**Moisture (%)**	<12.0	<12.0	<12.0	<12.0
2	**Hectoliter Weight (kg/hl)**	> 65.0	> 65.0	> 60.0	> 62.0
3	**Kernel Size** **Bold (On 2.5 mm)** **Thin (Through 2.2mm)**	Uniform plump >90% <3%	Uniform plump >90% <3%	Uniform plump >80% <5%	Uniform plump >80% <5%
4	**1000 grain weight(g)**	42-45	42-48	>40	42-48
5	**Husk Content**	<11.0%	<11.0%	<11%	<11.0%
6	**Protein Content (d.b.)**	9.0-12.0%	9.0-13%	9.0-12.0%	9.0-13%
7	**Germination Capacity**	>96%	>96%	>96%	>96%
8	**Germinative Energy (72hrs)**	>96%	>96%	>96%	>96%
9	**β--glucan (db)**	< 4.0%	<4.0%	<4.0%	<4.0%
MALT PARAMETERS					
7.	**Malt Homogeneity**	>90%	>90%	>90%	>90%
8.	**Malt Friability**	>65%	>70.0	>60%	>65.0
9.	**Total Protein (d.b.)**	4-5 %	4-5 %	4-5 %	4-5 %
10.	**Soluble/ total Protein (S/T) Ratio (Kolbach Index)**	40-44%	40-45%	40-44%	40-45%
11.	**Malt Extract (minimum) (fgdb)**	80%	>80.0%	78%	>78.0
12.	**Wort Viscosity**	<1.500 mPas	<1.500 mPas	<1.500 mPas	<1.500 mPas
13.	**Wort turbidity**	Clear	Clear	Clear	Clear
14.	**Diastatic Power(^{0}L)**	>90	>90	>90	>90
15.	**Wort β--glucan**	<300 ppm	<300 ppm	<300 ppm	<300 ppm
16.	**FAN**	>150 ppm	>150 ppm	>150 ppm	>150 ppm

REVISED PARAMETERS & WEIGHTAGE/SCORE FOR SELECTION OF PROMISING MALT BARLEY GENOTYPES (BOTH SIX & TWO ROW Type) IN INDIA (Revised on 28.07.2020)

S. No.	Parameter	Range (Score/ weight age)			
GRAIN PARAMETERS					
		Two Row		**Six Row**	
		Existing	**Revised**	**Existing**	**Revised**
1.	**Test weight / Hectoliter weight (kg/hl)**	<60=0 60- 63=1 63-65=2 >65=3	<61=0, 61.0- 63.0=1, 63.1-65.0=2, >65.0=3	<60=0 60- 63=1 63-65=2 >65=3	<60=0, 60.0- 62.0=1, 62.1-64.0=2, >64.0=3
2	**Bold grains (%) Grains retained on 2.5 mm screen**	>92=3 88-92=2 80-87=1 <80=0	>90.0=3, 88.0-90.0=2, 86.0-87.9=1, <86.0=0	>82= 3 78-82=2 70-77=1 <70=0	>80.0= 3, 78.0-80.0=2, 76.0-77.9=1, <76=0
3.	**Protein content (% db)**	<11=3 11-11.9=2 12-13= 1 >13=0	<10.0=1, 10.0-12.0=2, 12.1-13.0=3, 13.1-14.0=2, >14.0=1	<11.5=3 11.5-12.4=2 12.5-13.5= 1 >13.5=0	<10.0=1, 10.0-12.0=2, 12.1-13.0=3, 13.1-14.0=2, >14.0=1
4.	**Husk content (%db)**	<10.5=3 10.6-11.5=2 11.6-12.5=1 >12.5=0	<10.5=3, 10.5-11.5=2, 11.6-12.5=1, >12.5=0	<10.5=3 10.6-11.5=2 11.6-12.5=1 >12.5=0	<10.5=3, 10.5-11.5=2, 11.6-12.5=1, >12.5=0
5.	**Grain β- glucan content (%db)**	< 3.5=3 3.5-4.0=2 4.1-4.5=1 >4.5=0	<3.5=3, 3.5 - 4.5=2, 4.6-5.0=1, >5.0=0	< 3.5=3 3.5-4.0=2 4.1-4.5=1 >4.5=0	<3.5=3, 3.5 - 4.5=2, 4.6-5.0=1, >5.0=0
MALT PARAMETERS					
6.	**Malt Friability (%)**	>70=3 65-70=2 60-65=1 <60=0	>70=3, 66-70=2, 60-65.9=1, <60=0	>70=3 65-70=2 60-65=1 <60=0	>70=3, 66-70=2, 60-65.9=1, <60=0
7.	**Filtration rate (ml/hr)**	>250=3 200-250=2 150-200=1 <150=0	>250=3, 201-250=2, 150-200=1, <150=0	>250=3 200-250=2 150-200=1 <150=0	>250=3, 201-250=2, 150-200=1, <150=0
8.	**Hot Water Extract (fine grind dry weight basis)**	>80.0=3 78-80=2 76-78=1 <76=0	>80.0=3, 78.6-80.0=2, 77.0-78.5=1, <77.0=0	>78=3 76-78=2 74-76=1 <74=0	>78.5=3, 76.6-78.5=2, 74.5-76.5=1, <74.5=0
9.	**Diastatic Power(ºL)**	>90=3 80-90=2 <80=1	>90=3, 81-90=2, 70-80=1, <70=0	>90=3 80-90=2 <80=1	>90=3, 81-90=2, 70-80=1, <70=0
10.	**Wort β- glucan content (ppm)**	NA	<300=3, 301-350=2, 351-400=1, >400=0	NA	<300=3, 301-350=2, 351-400=1, >400=0
11.	**Free Amino Nitrogen (FAN content in ppm)**	NA	>150=3, 126-150=2, 100-125=1, <100=0	NA	>150=3, 126-150=2, 100-125=1, <100=0
12.	**Wort Viscosity (mPas)**	<1.500 = 3 1.501-1.550 =2 1.550-1.600 = 1 >1.600=0	<1.500 = 3 1.501-1.550 =2 1.550-1.600 = 1 >1.600=0	<1.500 = 3 1.501-1.550 =2 1.550-1.600 = 1 >1.600=0	<1.500 = 3 1.501-1.550 =2 1.550-1.600 = 1 >1.600=0
13.	**Kolbach index (%)**	40-45 = 3 37-39 & 46-48=2 35-37=1 <35 & >48=0	40-45 = 3, 38-39 & 46-48=2, 35-37=1, <35 & >48=0	40-45 = 3 37-39 & 46-48=2 35-37=1 <35 & >48=0	40-45 = 3, 38-39 & 46-48=2, 35-37=1, <35 & >48=0

** Finalized in first meeting of the "NATIONAL CORE GROUP ON MALT BARLEY DEVELOPMENT" at DWR, Karnal on 12 Dec., 1995 and revised during the annual workshop at IARI, New Delhi in August 2004 and further on 05.03.2016 at ICAR-IIWBR, Karnal. Latest revision on 28.07.2020.*

Annexure 2 a: AVT-TS-MALT BARLEY

GRAIN PARAMETERS

Table 2.1 a : Thousand grain weight (g) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	44.3	42.1	44.5	44.0	37.3	44.9	43.5	44.1	**43.1**
2	DWRB 196	60.4	65.4	57.1	57.1	56.8	48.4	65.0	65.4	**59.5**
3	DWRB 197	51.9	54.3	49.4	47.7	43.8	49.3	48.6	49.6	**49.3**
4	PL908*	44.0	48.2	42.6	42.1	38.9	42.0	42.6	44.2	**43.1**
5	BH902 (C)*	43.6	47.7	41.7	40.4	34.5	44.5	41.4	51.0	**43.1**
6	DWRB 101 (C)	48.0	51.9	46.0	43.1	42.6	45.4	49.6	49.7	**47.0**
7	DWRB123 (C)	51.1	59.2	51.5	47.5	50.2	52.1	52.9	54.1	**52.3**
8	DWRB160 (C)	60.8	69.5	60.9	59.5	48.7	60.7	61.5	68.0	**61.2**
9	RD2849 (C)	46.9	50.3	44.3	44.0	45.0	45.6	49.8	49.2	**46.9**
	Mean	**50.1**	**54.3**	**48.7**	**47.3**	**44.2**	**48.1**	**50.5**	**52.8**	

**= 6 row barley*

Table 2.2 a : Test weight (kg/hl) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	60.7	57.6	64.5	60.4	58.0	62.2	58.7	59.3	**60.2**
2	DWRB 196	61.1	59.5	62.7	57.2	56.5	66.7	57.9	57.2	**59.9**
3	DWRB 197	64.5	62.7	67.7	62.1	57.8	64.3	61.4	59.1	**62.4**
4	PL908*	66.0	52.0	60.7	53.5	59.9	49.9	56.6	50.3	**56.1**
5	BH902 (C)*	56.2	55.6	60.4	54.0	58.6	55.1	55.2	62.6	**57.2**
6	DWRB 101 (C)	63.8	64.5	67.3	62.8	59.0	58.7	63.2	61.4	**62.6**
7	DWRB123 (C)	65.4	63.1	67.8	61.4	61.8	63.1	62.4	62.9	**63.5**
8	DWRB160 (C)	60.9	59.5	64.2	57.3	61.4	59.3	57.1	55.1	**59.3**
9	RD2849 (C)	64.5	63.8	66.4	63.7	60.2	63.5	62.5	61.0	**63.2**
	Mean	**62.6**	**59.8**	**64.6**	**59.1**	**59.2**	**60.3**	**59.4**	**58.8**	

**= 6 row barley*

Table 2.3 a : Proportion of bold grains (%) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	85.6	78.5	82.8	86.4	89.7	90.7	83.6	92.2	**86.2**
2	DWRB 196	95.6	96.5	93.2	93.0	93.8	95.9	99.7	95.3	**95.4**
3	DWRB 197	94.9	98.4	95.2	90.6	94.8	93.3	91.2	92.3	**93.8**
4	PL908*	92.3	92.3	83.4	79.4	91.4	83.8	85.5	90.6	**87.3**
5	BH902 (C)*	88.1	94.4	79.4	84.3	62.5	83.9	80.3	91.6	**83.0**
6	DWRB 101 (C)	88.3	94.3	87.1	79.2	90.2	96.5	94.4	92.7	**90.3**
7	DWRB123 (C)	89.9	97.1	95.4	82.8	96.9	94.0	98.2	96.4	**93.8**
8	DWRB160 (C)	94.7	98.8	93.6	91.7	94.1	97.4	96.5	96.6	**95.4**
9	RD2849 (C)	84.9	91.8	78.8	84.3	92.9	87.4	93.4	91.0	**88.1**
	Mean	**90.5**	**93.6**	**87.7**	**85.7**	**89.6**	**91.4**	**91.4**	**93.2**	

*= 6 row barley

Table 2.4 a : Proportion of thin grains (%) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	2.8	5.4	4.1	2.7	2.6	1.2	4.6	1.3	**3.1**
2	DWRB 196	1.0	0.6	1.5	2.3	1.6	0.6	1.1	0.5	**1.1**
3	DWRB 197	0.6	0.3	0.6	1.1	0.8	0.7	2.1	0.6	**0.8**
4	PL908*	1.9	2.0	4.6	5.8	2.1	3.1	3.4	1.9	**3.1**
5	BH902 (C)*	2.6	1.6	5.3	3.6	14.2	2.5	5.5	1.5	**4.6**
6	DWRB 101 (C)	1.7	0.6	1.8	5.9	2.0	0.0	1.5	0.8	**1.8**
7	DWRB123 (C)	1.9	0.4	0.6	4.3	1.2	0.8	0.6	0.3	**1.2**
8	DWRB160 (C)	1.2	0.2	1.1	2.9	1.7	0.8	1.5	0.2	**1.2**
9	RD2849 (C)	3.0	1.2	4.1	3.2	1.7	2.2	1.6	0.8	**2.2**
	Mean	**1.9**	**1.4**	**2.6**	**3.5**	**3.1**	**1.3**	**2.4**	**0.9**	

*= 6 row barley

Table 2.5 a : Germinative energy (% 72hrs) of AVT (TS-MB) entries from different locations

Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
DWRB182	100	99	98	98	96	99	98	99	**98**
DWRB 196	99	84	98	99	100	99	98	100	**97**
DWRB 197	99	97	99	100	95	100	94	97	**98**
PL908*	98	96	99	100	96	98	97	99	**98**
BH902 (C)*	95	99	97	99	75	98	97	96	**95**
DWRB 101 (C)	99	99	100	97	93	98	99	98	**98**
DWRB123 (C)	97	100	100	100	100	100	98	100	**99**
DWRB160 (C)	99	99	100	99	95	100	98	100	**99**
RD2849 (C)	100	99	97	99	97	100	98	99	**99**
Mean	**98**	**97**	**99**	**99**	**94**	**99**	**97**	**99**	

*= 6 row barley

Table 2.6 a : Protein content (%) # of AVT (TS-MB) entries from different locations

Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
DWRB182	11.9	13.4	13.0	15.0	9.1	9.3	14.7	12.8	**12.4**
DWRB 196	10.2	10.3	11.8	13.1	9.4	9.5	10.0	11.7	**10.8**
DWRB 197	10.9	10.0	12.9	13.5	10.0	12.5	12.5	12.4	**11.8**
PL908*	11.2	11.7	12.4	13.4	8.8	8.8	13.6	12.7	**11.6**
BH902 (C)*	10.8	9.6	11.6	11.4	9.1	9.3	11.8	10.7	**10.5**
DWRB 101 (C)	11.3	10.9	12.6	12.8	8.6	9.2	10.6	12.1	**11.0**
DWRB123 (C)	11.1	10.3	11.4	13.7	9.6	7.9	11.7	11.7	**10.9**
DWRB160 (C)	10.7	9.9	12.1	13.7	9.4	9.4	10.7	12.1	**11.0**
RD2849 (C)	12.0	10.6	12.6	12.4	10.0	8.8	11.1	12.3	**11.2**
Mean	**11.1**	**10.7**	**12.3**	**13.2**	**9.3**	**9.4**	**11.9**	**12.1**	

*= 6 row barley # Predicted values through NIR

Table 2.7 a : Husk content (%) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	12.0	13.2	12.0	12.6	11.8	14.2	14.0	12.4	**12.8**
2	DWRB 196	10.3	10.3	10.6	14.8	14.0	12.2	14.4	14.7	**12.7**
3	DWRB 197	12.5	13.5	10.1	12.8	13.8	14.4	14.2	11.5	**12.8**
4	PL908*	13.8	13.1	11.9	12.2	11.4	13.8	13.6	12.3	**12.8**
5	BH902 (C)*	14.2	14.5	13.8	14.6	15.0	15.3	15.2	14.6	**14.7**
6	DWRB 101 (C)	11.7	12.7	12.2	12.8	11.0	13.9	13.3	10.9	**12.3**
7	DWRB123 (C)	12.9	14.8	11.5	12.8	14.6	14.8	13.6	12.4	**13.4**
8	DWRB160 (C)	12.8	14.7	11.4	12.0	13.8	14.1	14.5	13.7	**13.4**
9	RD2849 (C)	10.6	13.0	11.3	12.3	12.7	14.1	14.8	12.3	**12.6**
	Mean	**12.3**	**13.3**	**11.6**	**13.0**	**13.1**	**14.1**	**14.2**	**12.7**	

*= 6 row barley

Table 2.8 a : β--Glucan Content (% d.w.b.) of AVT(MB) entries at two locations

S.N.	Genotype	Karnal	Hisar	Mean
1	DWRB182	4.7	4.4	**4.5**
2	DWRB 196	6.6	6.8	**6.7**
3	DWRB 197	6.3	6.9	**6.6**
4	PL908*	5.6	4.8	**5.2**
5	BH902 (C)*	5.5	5.2	**5.3**
6	DWRB 101 (C)	5.4	5.7	**5.5**
7	DWRB123 (C)	5.6	5.7	**5.7**
8	DWRB160 (C)	6.4	7.4	**6.9**
9	RD2849 (C)	5.3	4.8	**5.0**
	Mean	**5.7**	**5.7**	

*= 6 row barley

Table 2.9 a : Moisture content in grains (%)# of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	8.7	12.7	7.4	9.6	10.5	12.3	9.1	11.3	**10.1**
2	DWRB 196	8.7	12.5	7.6	12.0	9.7	12.5	11.1	12.4	**10.3**
3	DWRB 197	8.7	11.9	7.4	9.9	11.0	12.3	9.1	11.3	**10.2**
4	PL908*	9.0	11.4	7.5	9.8	10.1	12.5	9.1	11.2	**10.2**
5	BH902 (C)*	8.8	10.8	7.6	9.6	10.6	12.3	8.3	11.4	**10.1**
6	DWRB 101 (C)	8.7	11.9	7.6	9.5	10.6	12.8	9.2	10.9	**10.1**
7	DWRB123 (C)	8.8	12.1	7.6	9.5	10.5	12.5	8.7	10.7	**10.1**
8	DWRB160 (C)	8.9	12.5	7.6	10.2	9.9	12.4	9.1	11.9	**10.1**
9	RD2849 (C)	8.7	11.9	7.8	9.6	10.0	14.1	9.2	10.6	**10.2**
	Mean	**8.8**	**12.0**	**7.6**	**10.0**	**10.3**	**12.6**	**9.2**	**11.3**	

*= 6 row barley # Predicted values through NIR

Table 2.10 a : Starch content in grains (%dwt basis)# of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	60.5	60.2	60.5	59.6	60.7	61.6	59.9	60.4	**60.4**
2	DWRB 196	61.8	61.2	61.8	59.6	61.5	63.3	61.1	59.9	**61.3**
3	DWRB 197	62.0	62.1	62.0	60.0	61.7	60.4	60.7	60.1	**61.1**
4	PL908*	60.2	60.5	60.2	59.7	63.4	62.6	60.6	59.0	**60.8**
5	BH902 (C)*	60.8	60.7	60.8	60.2	62.0	63.5	60.4	61.9	**61.3**
6	DWRB 101 (C)	61.6	61.5	61.6	60.6	60.5	61.7	62.3	60.3	**61.3**
7	DWRB123 (C)	61.4	61.1	61.4	59.9	60.5	63.0	61.0	61.0	**61.2**
8	DWRB160 (C)	61.5	61.6	61.5	59.8	61.6	62.7	60.5	59.9	**61.1**
9	RD2849 (C)	60.9	61.2	60.9	61.4	61.5	61.7	60.4	60.7	**61.1**
	Mean	**61.2**	**61.1**	**61.2**	**60.1**	**61.5**	**62.3**	**60.8**	**60.4**	

*= 6 row barley # Predicted values through NIR

MALT PARAMETERS

Table 2.9 a & 2.10 a: Malt friability (%) and homogeneity (%) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Ludhiana	Pantnagar	Bawal	Mean	Karnal	Hisar	Ludhiana	Pantnagar	Bawal	Mean
1	DWRB182	52	66	87	65	56	**65**	77	91	97	85	84	**87**
2	DWRB 196	59	66	72	66	50	**63**	72	88	95	95	85	**87**
3	DWRB 197	57	80	95	75	53	**72**	84	99	94	98	87	**92**
4	PL908*	28	54	67	53	36	**48**	52	72	81	78	68	**70**
5	BH902 (C)*	48	65	71	57	48	**58**	77	90	91	88	80	**85**
6	DWRB101 (C)	52	88	84	50	63	**67**	80	98	99	89	96	**92**
7	DWRB123 (C)	40	65	56	46	49	**51**	67	93	86	79	94	**84**
8	DWRB160 (C)	45	70	73	56	53	**59**	72	93	96	88	89	**88**
9	RD2849 (C)	73	72	53	60	60	**64**	86	95	90	92	93	**91**
	Mean	**50**	**70**	**73**	**58**	**52**		**74**	**91**	**92**	**88**	**86**	

*= 6 row barley

Table 2.11 a : Hot water extract (% fgdb) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	82.0	80.7	81.5	78.7	82.2	78.0	81.2	78.9	**80.4**
2	DWRB 196	79.3	81.0	79.6	74.2	82.3	83.1	82.6	73.4	**79.4**
3	DWRB 197	79.0	82.1	75.3	67.6	80.3	80.2	79.7	78.4	**77.8**
4	PL908*	81.0	78.0	74.5	76.5	82.3	82.8	82.3	74.6	**79.0**
5	BH902 (C)*	79.4	79.0	71.6	75.4	81.6	77.7	81.4	82.8	**78.6**
6	DWRB 101 (C)	80.3	80.8	79.7	73.0	81.6	81.3	79.0	79.6	**79.4**
7	DWRB123 (C)	78.3	79.8	82.4	78.0	82.4	81.8	81.8	82.1	**80.8**
8	DWRB160 (C)	81.2	80.8	81.6	79.6	80.8	73.8	78.8	78.4	**79.4**
9	RD2849 (C)	81.1	79.1	81.4	82.3	79.4	81.0	82.0	79.8	**80.8**
	Mean	**80.2**	**80.1**	**78.6**	**76.1**	**81.4**	**80.0**	**81.0**	**78.7**	

*= 6 row barley

Table 2.12 a : Wort filtration rate (ml/hr) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	260	290	270	280	270	290	230	280	**271**
2	DWRB 196	260	240	250	230	230	280	180	230	**238**
3	DWRB 197	230	240	260	210	220	240	260	220	**235**
4	PL908*	260	240	230	240	230	270	210	250	**241**
5	BH902 (C)*	180	230	200	130	150	150	200	210	**181**
6	DWRB 101 (C)	250	270	240	230	240	260	230	250	**246**
7	DWRB123 (C)	240	260	260	240	170	260	220	230	**235**
8	DWRB160 (C)	220	230	230	220	150	240	150	220	**208**
9	RD2849 (C)	250	250	240	230	250	260	220	240	**243**
	Mean	**239**	**250**	**242**	**223**	**212**	**250**	**211**	**237**	

*= 6 row barley

Table 2.13 a : Saccharification rate (minutes) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	5.0	5.0	5.0	5.0	5.0	10.0	5.0	5.0	**5.6**
2	DWRB 196	5.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	**5.6**
3	DWRB 197	5.0	5.0	5.0	5.0	5.0	10.0	5.0	5.0	**5.6**
4	PL908*	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0	**6.3**
5	BH902 (C)*	5.0	5.0	5.0	5.0	5.0	10.0	10.0	5.0	**6.3**
6	DWRB 101 (C)	5.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0	**5.6**
7	DWRB123 (C)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.0**
8	DWRB160 (C)	5.0	5.0	10.0	5.0	5.0	10.0	5.0	5.0	**6.3**
9	RD2849 (C)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	**5.6**
	Mean	**5.6**	**5.6**	**5.6**	**5.6**	**5.6**	**7.2**	**5.6**	**5.6**	

*= 6 row barley

Table 2.14 a : Wort pH of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	6.2	6.2	6.2	6.2	6.4	6.4	6.2	6.2	**6.3**
2	DWRB 196	6.3	6.3	6.2	6.1	6.4	6.3	6.2	6.2	**6.2**
3	DWRB 197	6.2	6.2	6.2	6.2	6.3	6.4	6.2	6.3	**6.3**
4	PL908*	6.3	6.3	6.3	6.2	6.2	6.5	6.2	6.3	**6.3**
5	BH902 (C)*	6.2	6.2	6.2	6.2	6.2	6.3	6.2	6.1	**6.2**
6	DWRB 101 (C)	6.2	6.2	6.1	7.0	6.2	6.4	6.2	6.1	**6.3**
7	DWRB123 (C)	6.3	6.3	6.0	6.1	6.3	6.3	6.2	6.1	**6.2**
8	DWRB160 (C)	6.3	6.3	6.2	6.1	6.3	6.4	6.2	6.2	**6.2**
9	RD2849 (C)	6.2	6.2	6.1	6.1	6.2	6.3	6.2	6.1	**6.2**
	Mean	**6.2**	**6.2**	**6.1**	**6.3**	**6.3**	**6.3**	**6.2**	**6.2**	

*= 6 row barley

Table 2.15 a : Diastatic power (^{0}L) of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	89	106	109	75	56	63	62	79	**80**
2	DWRB 196	88	102	96	76	57	55	68	62	**75**
3	DWRB 197	83	94	86	81	61	76	98	67	**81**
4	PL908*	69	100	82	75	56	67	92	89	**79**
5	BH902 (C)*	85	75	84	70	81	77	104	66	**80**
6	DWRB 101 (C)	60	68	62	68	52	68	57	52	**61**
7	DWRB123 (C)	88	85	55	69	51	52	88	63	**69**
8	DWRB160 (C)	78	79	99	68	51	58	85	82	**75**
9	RD2849 (C)	76	84	76	64	49	52	53	61	**64**
	Mean	**80**	**88**	**83**	**72**	**57**	**63**	**79**	**69**	

*= 6 row barley

Table 2.16 a : Kolbach Index (KI) # of AVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	DWRB182	36	38	35	34	39	41	37	36	**37**
2	DWRB 196	39	40	39	37	38	41	38	42	**39**
3	DWRB 197	39	38	37	36	39	42	38	38	**38**
4	PL908*	38	40	37	36	41	42	42	44	**40**
5	BH902 (C)*	40	40	39	38	41	43	39	40	**40**
6	DWRB 101 (C)	37	37	36	37	43	38	40	39	**38**
7	DWRB123 (C)	38	44	37	37	38	41	39	39	**39**
8	DWRB160 (C)	38	40	37	37	41	41	39	44	**40**
9	RD2849 (C)	38	40	38	37	39	38	39	38	**39**
	Mean	**38**	**40**	**37**	**37**	**40**	**41**	**39**	**40**	

*= 6 row barley #NIR predicted values

Table 2.17 a 2.18a : Wort FAN (ppm) & wort β--glucan (ppm) of AVT (MB) entries from different locations

S.N.	Genotype	Wort FAN (ppm)			Wort β-glucan (ppm)		
		Karnal	**Hisar**	**Mean**	**Karnal**	**Hisar**	**Mean**
1	DWRB182	200	186	**193**	406	230	**318**
2	DWRB 196	123	168	**145**	1043	421	**732**
3	DWRB 197	205	192	**198**	325	170	**248**
4	PL908*	194	171	**183**	721	491	**606**
5	BH902 (C)*	196	201	**199**	499	395	**447**
6	DWRB 101 (C)	212	231	**222**	522	264	**393**
7	DWRB123 (C)	149	196	**172**	680	460	**570**
8	DWRB160 (C)	157	180	**168**	1049	537	**793**
9	RD2849 (C)	218	212	**215**	436	316	**376**
	Mean	**184**	**193**		**631**	**365**	

*= 6 row barley

Annexure 2 b: IVT-MALT BARLEY

GRAIN PARAMETERS

Table 2.1 b : Thousand grain weight (g) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	42.3	44.2	42.3	36.4	29.0	41.5	43.4	37.4	**39.6**
2	BH1026	56.3	57.2	56.3	52.0	61.2	56.0	59.2	55.7	**56.7**
3	BH1027	51.1	55.7	51.1	54.3	60.1	54.2	53.0	59.4	**54.9**
4	BH1028	59.9	64.3	59.9	55.1	46.6	62.1	63.0	52.6	**57.9**
5	DWRB209	43.0	55.3	43.0	56.9	41.7	54.5	48.8	54.7	**49.7**
6	DWRB210	52.5	63.7	52.5	51.6	48.3	59.1	60.8	60.3	**56.1**
7	DWRB211	52.2	55.1	52.2	69.0	44.5	52.9	56.0	53.1	**54.4**
8	DWRB212	53.1	54.6	53.1	54.6	47.1	54.3	69.8	49.5	**54.5**
9	PL912	47.5	57.6	47.5	53.2	63.0	57.2	56.9	55.0	**54.7**
10	PL916	45.5	54.7	45.5	44.0	47.7	50.3	46.5	42.1	**47.0**
11	PL919	48.9	54.4	48.9	47.3	44.3	52.2	48.9	46.6	**48.9**
12	RD3023	54.0	59.7	54.0	57.4	54.3	60.2	66.6	59.3	**58.2**
13	RD3024	50.2	58.4	50.2	49.6	46.4	55.6	54.7	52.8	**52.2**
14	RD3025	46.5	52.4	46.5	46.8	46.1	46.7	37.8	50.3	**46.6**
15	RD3026	45.7	50.9	45.7	45.2	46.8	50.0	52.6	50.4	**48.4**
16	UPB1089	47.5	52.6	47.5	47.8	37.7	48.0	48.5	48.0	**47.2**
17	UPB1090	52.5	57.7	52.5	69.5	57.3	50.6	67.6	54.9	**57.8**
18	BH946(C)*	39.5	45.8	39.5	37.9	30.5	42.0	47.7	44.5	**40.9**
19	DWRB101(C)	45.8	47.6	45.8	48.0	44.0	46.5	52.1	45.8	**46.9**
20	DWRB123(C)	46.3	56.6	46.3	51.6	42.9	53.1	54.8	52.4	**50.5**
21	DWRB160(C)	62.4	66.5	62.4	56.9	62.5	67.0	69.8	63.7	**63.9**
22	RD2849 (C)	45.9	47.6	45.9	45.8	42.5	45.5	47.7	47.9	**46.1**
	Mean	**49.5**	**55.1**	**49.5**	**51.4**	**47.5**	**52.7**	**55.3**	**51.7**	

*= 6 row barley

Table 2.2 b : Test weight (kg/hl) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	63.8	61.1	68.2	53.7	59.3	62.8	58.4	59.6	**60.8**
2	BH1026	63.3	62.9	65.6	59.8	63.0	61.2	59.1	58.2	**61.6**
3	BH1027	62.8	62.4	66.6	60.9	63.7	61.1	60.1	60.5	**62.3**
4	BH1028	57.0	61.2	63.5	52.3	61.8	56.4	52.9	60.0	**58.1**
5	DWRB209	60.0	61.7	65.5	61.6	62.7	58.8	58.1	60.0	**61.0**
6	DWRB210	62.8	64.4	66.7	56.5	65.5	52.5	58.7	58.0	**60.6**
7	DWRB211	62.7	62.6	68.1	58.8	64.1	59.4	61.2	60.6	**62.2**
8	DWRB212	61.8	61.5	65.7	58.3	65.3	60.9	57.4	59.5	**61.3**
9	PL912	61.2	61.8	65.2	61.6	62.7	60.8	58.4	60.4	**61.5**
10	PL916	61.1	64.2	63.7	55.7	63.5	56.3	57.7	53.3	**59.4**
11	PL919	62.1	63.5	67.6	56.8	69.7	59.0	56.7	58.7	**61.8**
12	RD3023	56.3	58.5	62.6	57.8	60.5	58.9	54.2	55.5	**58.0**
13	RD3024	60.5	63.0	64.5	57.3	62.8	61.7	60.8	59.9	**61.3**
14	RD3025	55.8	58.9	63.5	53.6	60.1	52.6	52.1	53.0	**56.2**
15	RD3026	59.5	59.3	66.3	53.6	62.4	55.6	61.3	54.1	**59.0**
16	UPB1089	61.4	63.1	65.6	59.1	62.9	62.3	58.7	60.2	**61.7**
17	UPB1090	62.1	63.2	64.6	57.8	62.5	59.2	59.1	59.7	**61.0**
18	BH946(C)*	57.1	56.0	61.4	51.6	54.0	51.2	57.4	52.4	**55.1**
19	DWRB101(C)	63.6	65.5	68.8	62.3	66.2	62.6	61.1	61.9	**64.0**
20	DWRB123(C)	63.4	65.0	68.1	60.0	61.3	64.5	60.8	59.8	**62.9**
21	DWRB160(C)	61.5	61.3	63.0	55.5	61.7	55.6	56.0	57.5	**59.0**
22	RD2849 (C)	64.2	66.4	67.3	59.8	66.6	63.1	60.8	61.8	**63.7**
	Mean	**61.1**	**62.2**	**65.5**	**57.5**	**62.8**	**58.9**	**58.2**	**58.4**	

*= 6 row barley

Table 2.3 b : Proportion of bold grains (%) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	78.5	86.5	97.1	66.0	49.1	87.4	83.0	94.6	**80.3**
2	BH1026	95.7	98.2	95.3	91.7	92.4	70.5	98.5	96.6	**92.4**
3	BH1027	94.0	95.8	98.3	95.6	92.8	96.4	86.2	97.2	**94.6**
4	BH1028	91.5	97.3	96.3	91.6	74.4	91.4	82.3	92.7	**89.7**
5	DWRB209	82.8	98.1	96.1	97.6	88.4	90.4	90.7	96.6	**92.6**
6	DWRB210	92.3	98.8	97.0	86.9	91.5	95.0	96.4	97.5	**94.4**
7	DWRB211	90.0	96.6	91.8	92.4	93.0	90.6	94.1	92.4	**92.6**
8	DWRB212	94.6	96.2	96.4	93.8	91.7	89.7	92.1	93.8	**93.5**
9	PL912	76.3	96.3	88.7	71.3	80.1	95.3	92.5	90.3	**86.4**
10	PL916	70.6	90.5	60.3	63.6	86.6	84.2	78.4	73.1	**75.9**
11	PL919	74.0	91.4	84.3	75.6	80.2	82.5	86.8	76.6	**81.4**
12	RD3023	86.3	97.5	89.1	95.4	97.5	90.8	94.4	97.1	**93.5**
13	RD3024	94.1	98.2	95.5	84.6	92.3	96.2	98.7	94.2	**94.2**
14	RD3025	85.4	96.0	87.6	89.2	92.0	73.6	75.7	92.8	**86.5**
15	RD3026	89.7	96.0	98.3	90.8	94.9	84.9	97.1	96.5	**93.5**
16	UPB1089	88.7	96.9	96.8	84.0	74.7	94.5	89.4	91.3	**89.5**
17	UPB1090	92.8	97.3	97.7	84.0	82.4	94.8	97.3	79.9	**90.8**
18	BH946(C)*	80.8	95.6	91.9	75.3	60.9	92.3	91.7	94.1	**85.3**
19	DWRB101(C)	83.8	96.1	89.8	87.5	90.5	82.0	95.8	90.8	**89.5**
20	DWRB123(C)	84.5	97.7	95.8	91.2	79.2	88.9	98.4	91.1	**90.8**
21	DWRB160(C)	94.5	99.0	96.0	92.7	96.5	97.3	92.4	94.1	**95.3**
22	RD2849 (C)	81.0	90.2	81.7	80.9	91.6	89.9	91.2	90.5	**87.1**
	Mean	**86.4**	**95.7**	**91.9**	**85.5**	**85.1**	**89.0**	**91.0**	**91.5**	

*= 6 row barley

Table 2.4 b : Proportion of thin grains (%) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	5.3	1.3	0.4	7.7	19.7	1.7	4.2	0.5	**5.1**
2	BH1026	1.0	0.3	0.1	2.1	2.2	0.6	0.9	0.6	**1.0**
3	BH1027	1.3	1.2	0.1	0.7	2.2	0.5	1.0	0.4	**0.9**
4	BH1028	2.3	0.4	0.6	10.0	8.8	0.8	5.1	1.4	**3.7**
5	DWRB209	5.2	0.4	1.4	6.8	13.0	1.3	1.9	1.1	**3.9**
6	DWRB210	4.0	0.4	1.0	1.5	2.8	3.5	1.2	1.0	**1.9**
7	DWRB211	4.4	0.2	0.5	1.1	7.0	0.9	0.6	1.2	**2.0**
8	DWRB212	11.2	0.1	0.9	1.9	1.2	0.3	1.5	0.6	**2.2**
9	PL912	6.0	0.5	0.8	0.7	3.9	2.5	3.1	0.4	**2.2**
10	PL916	1.7	0.2	0.4	2.6	2.7	0.3	1.5	0.2	**1.2**
11	PL919	2.2	0.4	0.9	1.3	2.2	1.5	3.2	2.1	**1.7**
12	RD3023	1.1	0.3	0.6	1.9	2.2	1.1	2.0	0.8	**1.3**
13	RD3024	6.4	0.5	0.5	2.8	4.7	0.8	1.3	0.6	**2.2**
14	RD3025	7.4	0.7	6.9	4.9	3.9	2.6	4.3	7.1	**4.7**
15	RD3026	7.0	0.9	2.4	3.6	2.8	1.1	2.8	5.4	**3.2**
16	UPB1089	4.8	0.8	3.1	2.7	2.8	1.4	1.9	1.6	**2.4**
17	UPB1090	3.5	0.5	1.6	0.7	0.8	0.7	1.3	0.4	**1.2**
18	BH946(C)*	1.1	0.2	0.4	2.0	2.2	0.7	0.4	1.4	**1.0**
19	DWRB101(C)	4.3	1.1	2.4	2.4	1.4	9.4	6.2	1.5	**3.6**
20	DWRB123(C)	3.5	0.8	0.3	1.8	1.3	1.4	0.4	0.4	**1.2**
21	DWRB160(C)	3.0	0.4	0.6	3.4	8.1	1.5	2.6	1.6	**2.6**
22	RD2849 (C)	1.6	0.2	0.2	3.6	5.6	0.6	0.5	5.0	**2.2**
	Mean	**4.0**	**0.5**	**1.2**	**3.0**	**4.6**	**1.6**	**2.2**	**1.6**	

*= 6 row barley

Table 2.5 b : Germinative energy (% 72hrs) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	99	94	93	96	78	99	100	94	**94**
2	BH1026	100	99	99	100	98	98	97	97	**99**
3	BH1027	100	98	98	97	35	99	99	86	**89**
4	BH1028	100	99	92	96	89	99	100	100	**97**
5	DWRB209	98	97	94	99	93	97	99	100	**97**
6	DWRB210	100	100	93	97	90	71	100	100	**94**
7	DWRB211	97	99	99	100	94	93	95	100	**97**
8	DWRB212	100	100	98	97	97	99	93	98	**98**
9	PL912	97	99	99	100	92	100	97	100	**98**
10	PL916	100	99	98	99	85	97	98	97	**97**
11	PL919	98	100	100	98	94	100	94	90	**97**
12	RD3023	99	100	98	99	89	89	95	98	**96**
13	RD3024	99	95	97	100	89	97	86	100	**95**
14	RD3025	99	85	100	99	91	97	98	95	**96**
15	RD3026	88	99	93	98	93	100	99	99	**96**
16	UPB1089	100	100	96	99	88	98	96	98	**97**
17	UPB1090	100	99	100	100	91	98	94	98	**98**
18	BH946(6RC)*	96	94	100	100	96	99	87	100	**97**
19	DWRB101(C)	95	98	99	96	90	89	95	99	**95**
20	DWRB123(C)	100	99	97	99	89	98	93	98	**97**
21	DWRB160(C)	99	99	99	97	96	98	97	98	**98**
22	RD2849 (C)	96	100	100	99	72	100	97	99	**95**
	Mean	**98**	**98**	**97**	**98**	**88**	**96**	**96**	**97**	

**= 6 row barley*

Table 2.6 b : Protein content (%) # of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	11.0	8.5	11.5	14.8	13.6	9.0	12.8	12.0	**11.7**
2	BH1026	12.4	10.7	12.4	14.1	11.3	13.7	13.5	12.8	**12.6**
3	BH1027	13.2	11.4	12.6	11.8	12.2	10.3	13.9	12.1	**12.2**
4	BH1028	10.2	9.6	11.3	11.6	12.4	9.4	12.3	12.6	**11.2**
5	DWRB209	10.9	9.3	11.5	11.5	11.7	8.5	12.8	12.0	**11.0**
6	DWRB210	12.8	11.3	12.0	13.6	11.2	8.5	12.9	11.6	**11.7**
7	DWRB211	11.9	10.0	10.5	9.3	11.7	11.3	13.0	12.6	**11.3**
8	DWRB212	12.4	10.5	13.2	13.0	12.7	10.6	13.9	12.1	**12.3**
9	PL912	12.4	10.9	13.0	13.7	10.5	9.5	13.1	12.5	**12.0**
10	PL916	12.1	9.3	13.0	15.0	11.7	11.2	12.9	12.2	**12.2**
11	PL919	12.4	8.9	12.6	15.1	11.5	9.2	12.9	13.7	**12.0**
12	RD3023	12.0	9.6	12.2	11.4	11.5	8.7	12.6	11.3	**11.2**
13	RD3024	10.7	10.3	9.5	12.6	10.6	9.7	12.7	11.7	**11.0**
14	RD3025	11.2	8.8	9.9	12.6	13.2	10.1	12.5	10.9	**11.2**
15	RD3026	13.4	10.6	11.8	13.3	11.9	9.3	13.2	11.8	**11.9**
16	UPB1089	12.1	10.4	11.1	12.7	12.0	9.1	11.2	10.7	**11.2**
17	UPB1090	12.4	9.7	11.5	13.0	10.9	12.1	11.4	12.8	**11.7**
18	BH946(C)*	11.7	10.2	10.5	12.2	10.7	10.3	12.3	10.9	**11.1**
19	DWRB101(C)	12.2	10.1	11.1	14.0	12.9	9.8	11.4	12.7	**11.8**
20	DWRB123(C)	13.0	9.9	11.4	13.7	10.3	9.7	11.8	11.9	**11.5**
21	DWRB160(C)	10.7	9.8	10.5	11.6	14.1	10.5	13.0	11.8	**11.5**
22	RD2849 (C)	12.0	9.0	10.7	13.7	11.9	9.0	11.8	11.6	**11.2**
	Mean	**12.0**	**9.9**	**11.5**	**12.9**	**11.8**	**10.0**	**12.6**	**12.0**	

*= 6 row barley # Predicted values through NIR

Table 2.7 b : Husk content (%) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	10.5	14.0	12.4	10.2	14.8	13.3	15.2	12.0	**12.8**
2	BH1026	10.6	12.1	15.2	10.3	11.9	15.3	13.9	14.0	**12.9**
3	BH1027	11.4	12.6	12.5	11.8	12.5	14.3	15.4	13.8	**13.0**
4	BH1028	10.2	16.3	14.5	11.8	10.7	13.8	13.7	10.3	**12.7**
5	DWRB209	9.6	9.6	9.4	10.9	12.1	13.5	15.2	11.7	**11.5**
6	DWRB210	14.9	12.2	14.3	13.6	12.5	14.9	13.7	13.9	**13.7**
7	DWRB211	10.1	14.8	14.7	14.4	14.7	16.0	12.8	15.5	**14.1**
8	DWRB212	12.7	14.1	14.7	10.0	12.4	15.3	13.6	11.6	**13.0**
9	PL912	11.3	14.8	12.7	10.4	11.0	14.8	16.2	11.2	**12.8**
10	PL916	15.3	13.3	15.5	11.1	11.0	13.1	14.5	14.3	**13.5**
11	PL919	13.9	14.0	15.1	11.3	14.0	15.9	15.8	10.7	**13.8**
12	RD3023	10.6	15.0	13.9	10.8	11.6	14.8	13.8	13.4	**13.0**
13	RD3024	10.3	14.3	13.7	13.5	12.7	12.5	13.7	13.1	**13.0**
14	RD3025	12.6	14.8	13.5	10.2	12.6	14.0	15.3	14.9	**13.5**
15	RD3026	14.6	16.5	15.4	10.8	12.9	15.2	15.1	13.7	**14.3**
16	UPB1089	11.0	16.1	13.9	11.7	9.9	15.2	14.5	12.1	**13.1**
17	UPB1090	12.3	16.4	13.5	11.6	13.3	15.7	13.6	12.9	**13.7**
18	BH946(C)*	16.7	16.8	16.0	15.3	14.0	15.8	13.2	15.3	**15.4**
19	DWRB101(C)	12.3	12.1	13.5	10.9	10.5	13.0	13.2	11.4	**12.1**
20	DWRB123(C)	12.7	14.8	12.2	12.0	14.6	14.6	14.2	13.0	**13.5**
21	DWRB160(C)	13.2	14.0	13.2	14.1	12.9	14.5	14.2	15.6	**14.0**
22	RD2849 (C)	11.3	14.4	13.2	11.0	13.9	14.9	14.3	11.0	**13.0**
	Mean	**12.2**	**14.2**	**13.8**	**11.7**	**12.6**	**14.6**	**14.3**	**13.0**	

*= 6 row barley

Table 2.8 b : Grain β--Glucan Content (% d.w.b.) of IVT(MB) entries at two locations

S.N.	Genotype	Karnal	Hisar	Mean
1	ABI Kranti	4.3	4.5	**4.4**
2	BH1026	6.5	6.4	**6.5**
3	BH1027	6.2	5.5	**5.9**
4	BH1028	6.0	6.5	**6.2**
5	DWRB209	4.8	4.9	**4.9**
6	DWRB210	5.2	5.6	**5.4**
7	DWRB211	5.0	4.1	**4.5**
8	DWRB212	5.9	5.2	**5.6**
9	PL912	5.9	5.3	**5.6**
10	PL916	4.5	5.5	**5.0**
11	PL919	4.9	5.0	**5.0**
12	RD3023	5.0	5.0	**5.0**
13	RD3024	5.3	5.3	**5.3**
14	RD3025	4.3	3.8	**4.0**
15	RD3026	6.2	6.7	**6.5**
16	UPB1089	6.6	5.8	**6.2**
17	UPB1090	5.9	5.0	**5.5**
18	BH946(C)*	5.4	5.1	**5.2**
19	DWRB101(C)	5.4	5.0	**5.2**
20	DWRB123(C)	5.1	4.8	**5.0**
21	DWRB160(C)	7.0	6.5	**6.7**
22	RD2849 (C)	4.8	5.0	**4.9**
	Mean	**5.5**	**5.3**	

**six row barley*

Table 2.9 a : Moisture content in grains (%)# of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	8.8	12.3	7.3	9.7	10.4	12.5	9.7	8.4	**9.9**
2	BH1026	9.4	12.1	7.3	10.2	11.3	12.5	12.0	10.8	**10.7**
3	BH1027	8.8	12.6	7.3	9.9	10.6	12.3	10.4	10.8	**10.3**
4	BH1028	8.9	13.0	7.7	11.2	11.0	12.6	9.6	8.9	**10.4**
5	DWRB209	9.0	12.2	8.2	11.8	10.8	12.5	11.3	9.5	**10.7**
6	DWRB210	9.0	11.7	7.6	10.4	11.7	12.8	13.9	9.1	**10.8**
7	DWRB211	8.8	12.5	7.4	10.8	11.2	12.7	11.3	9.5	**10.5**
8	DWRB212	8.8	12.5	7.2	10.0	10.6	13.4	10.6	9.4	**10.3**
9	PL912	8.4	13.2	7.7	10.6	11.3	12.4	11.6	9.3	**10.6**
10	PL916	8.8	11.5	7.3	10.1	10.7	12.3	10.1	9.7	**10.1**
11	PL919	8.7	12.2	7.4	10.8	10.8	12.6	11.1	8.5	**10.3**
12	RD3023	9.2	12.8	7.8	11.2	11.0	12.4	10.8	8.9	**10.5**
13	RD3024	8.6	11.6	7.7	10.1	11.2	12.6	10.6	8.4	**10.1**
14	RD3025	9.0	13.3	7.3	10.4	10.7	12.9	11.9	9.9	**10.7**
15	RD3026	8.4	12.6	7.5	10.0	10.7	13.1	10.5	9.8	**10.3**
16	UPB1089	8.6	13.2	7.4	9.7	10.6	12.4	11.2	9.1	**10.3**
17	UPB1090	8.6	12.0	8.4	10.5	11.3	12.6	12.2	9.0	**10.6**
18	BH946(C)*	8.5	13.0	7.4	9.6	10.7	12.6	11.7	10.9	**10.6**
19	DWRB101(C)	8.4	12.3	7.4	10.3	10.8	12.4	11.0	9.3	**10.2**
20	DWRB123(C)	8.7	12.1	7.4	9.7	11.1	12.7	11.5	8.6	**10.2**
21	DWRB160(C)	9.0	13.0	7.5	10.2	11.0	13.5	12.1	10.3	**10.8**
22	RD2849 (C)	8.2	10.7	7.3	10.5	11.2	12.6	11.2	8.8	**10.1**
	Mean	**8.8**	**12.4**	**7.5**	**10.4**	**10.9**	**12.7**	**11.2**	**9.4**	

*= 6 row barley # Predicted values through NIR

Table 2.10 a : Starch content in grains (%dwt basis)# of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	62.1	62.8	62.1	63.1	59.0	63.1	60.8	61.3	**61.2**
2	BH1026	60.3	61.3	60.3	62.8	62.2	51.3	60.6	59.5	**60.9**
3	BH1027	61.0	61.7	61.0	62.1	61.0	62.3	60.4	60.2	**61.0**
4	BH1028	60.7	61.6	60.7	61.8	60.5	62.1	60.4	60.4	**61.3**
5	DWRB209	61.6	61.9	61.6	61.2	62.1	62.7	60.3	59.8	**61.2**
6	DWRB210	60.0	60.7	60.0	61.0	60.6	62.7	60.5	59.4	**60.9**
7	DWRB211	60.5	61.8	60.5	65.4	62.8	61.2	59.3	60.3	**60.7**
8	DWRB212	60.1	61.0	60.1	61.4	61.4	60.6	58.9	59.6	**60.6**
9	PL912	60.4	60.3	60.4	61.2	60.7	61.9	59.3	59.1	**61.3**
10	PL916	61.1	62.6	61.1	61.7	60.7	62.1	60.0	59.7	**60.9**
11	PL919	61.4	63.5	61.4	63.9	60.8	62.0	59.7	61.1	**61.3**
12	RD3023	60.3	61.0	60.3	61.3	62.1	61.0	59.3	60.3	**60.6**
13	RD3024	61.0	61.2	61.0	61.7	61.9	62.9	60.4	60.2	**61.0**
14	RD3025	60.2	61.7	60.2	63.2	61.2	62.1	59.6	59.6	**61.0**
15	RD3026	59.0	60.6	59.0	61.7	62.0	61.7	59.3	59.1	**61.1**
16	UPB1089	60.7	61.5	60.7	60.8	61.8	61.7	60.8	60.7	**61.0**
17	UPB1090	60.5	61.7	60.5	61.0	61.9	59.7	59.8	59.7	**60.9**
18	BH946(C)*	60.1	60.4	60.1	62.6	62.1	62.2	60.1	59.0	**61.0**
19	DWRB101(C)	61.5	61.7	61.5	63.7	61.4	61.7	60.4	60.1	**61.2**
20	DWRB123(C)	60.1	61.4	60.1	63.9	62.1	62.0	60.3	60.3	**60.9**
21	DWRB160(C)	60.9	61.0	60.9	62.2	60.2	61.8	59.9	59.8	**60.9**
22	RD2849 (C)	61.3	62.1	61.3	62.6	62.1	63.1	60.5	60.6	**61.1**
	Mean	**60.7**	**61.5**	**60.7**	**62.3**	**61.4**	**61.5**	**60.0**	**60.0**	

*= 6 row barley # Predicted values through NIR

Table 2.9 b : Malt friability (%) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Ludhiana	Pantnagar	Bawal	Mean
1	ABI Kranti	76.5	92.3	89.6	90.9	46.1	**79.1**
2	BH1026	63.0	76.7	57.6	72.3	49.0	**63.7**
3	BH1027	64.4	81.6	66.0	68.3	57.9	**67.6**
4	BH1028	41.2	65.6	39.4	47.0	38.8	**46.4**
5	DWRB209	74.9	88.1	58.3	52.4	48.1	**64.4**
6	DWRB210	54.4	82.2	63.2	58.1	47.3	**61.0**
7	DWRB211	63.0	82.0	94.1	58.3	56.7	**70.8**
8	DWRB212	56.8	73.1	63.3	62.5	36.3	**58.4**
9	PL912	60.6	76.5	68.3	56.3	74.8	**67.3**
10	PL916	69.4	87.2	68.0	58.3	49.5	**66.5**
11	PL919	61.6	98.8	78.8	57.0	38.1	**66.9**
12	RD3023	53.6	83.5	73.5	51.9	43.9	**61.3**
13	RD3024	65.4	72.9	55.5	63.2	48.3	**61.1**
14	RD3025	66.7	76.7	62.8	41.0	33.3	**56.1**
15	RD3026	62.9	61.5	23.8	53.3	38.6	**48.0**
16	UPB1089	80.0	83.3	44.9	52.9	43.8	**61.0**
17	UPB1090	59.7	86.6	62.0	70.3	41.9	**64.1**
18	BH946(C)*	57.4	71.1	99.1	52.1	44.4	**64.8**
19	DWRB101(C)	65.5	79.6	47.7	56.1	47.2	**59.2**
20	DWRB123(C)	41.3	77.7	48.5	44.7	55.3	**53.5**
21	DWRB160(C)	56.0	80.2	77.0	52.3	47.4	**62.6**
22	RD2849 (C)	78.5	82.1	46.2	62.8	58.3	**65.6**
	Mean	**62.4**	**80.0**	**63.1**	**58.3**	**47.5**	

*= 6 row barley

Table 2.10 b : Malt homogeneity (%) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Ludhiana	Pantnagar	Bawal	Mean
1	ABI Kranti	94.5	98.8	96.3	99.0	86.3	**95.0**
2	BH1026	84.1	96.7	76.2	93.3	77.7	**85.6**
3	BH1027	86.0	97.1	73.8	90.6	84.7	**86.5**
4	BH1028	61.2	83.3	46.5	65.8	59.6	**63.3**
5	DWRB209	96.8	98.2	69.2	75.2	84.7	**84.8**
6	DWRB210	78.3	94.7	74.8	87.2	87.4	**84.5**
7	DWRB211	86.1	98.3	93.6	83.7	90.6	**90.5**
8	DWRB212	82.2	93.6	67.7	83.9	67.0	**78.9**
9	PL912	87.9	96.2	83.2	89.2	95.8	**90.5**
10	PL916	91.9	97.7	77.4	78.5	76.1	**84.3**
11	PL919	85.3	99.3	88.6	77.2	85.0	**87.1**
12	RD3023	80.4	96.5	79.1	77.8	76.4	**82.0**
13	RD3024	85.4	96.1	65.0	89.2	83.8	**83.9**
14	RD3025	88.3	92.0	70.5	64.8	58.8	**74.9**
15	RD3026	87.0	85.0	31.9	74.3	65.7	**68.8**
16	UPB1089	81.5	97.4	51.7	79.0	76.4	**77.2**
17	UPB1090	85.4	98.1	79.7	93.8	78.8	**87.2**
18	BH946(C)*	78.1	91.8	84.1	72.6	74.3	**80.2**
19	DWRB101(C)	90.8	97.4	72.0	83.8	81.4	**85.1**
20	DWRB123(C)	67.5	97.1	64.7	74.1	85.3	**77.8**
21	DWRB160(C)	79.7	93.8	89.3	88.8	85.6	**87.4**
22	RD2849 (C)	85.3	98.0	65.1	89.9	92.1	**86.1**
	Mean	**83.8**	**95.3**	**72.8**	**82.4**	**79.7**	

*= 6 row barley

Table 2.11 b : Hot water extract (% fgdb) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	82.6	80.0	79.7	80.7	80.0	79.4	78.6	79.7	**80.1**
2	BH1026	79.3	82.5	82.3	73.5	81.0	76.5	82.0	79.0	**79.5**
3	BH1027	79.4	82.9	80.7	82.2	79.1	79.8	83.0	81.3	**81.1**
4	BH1028	79.0	80.7	75.8	72.1	82.6	80.4	83.4	79.3	**79.2**
5	DWRB209	80.7	78.8	81.9	82.1	82.6	78.8	82.3	81.5	**81.1**
6	DWRB210	76.7	81.8	78.9	78.3	78.9	81.6	78.2	82.1	**79.5**
7	DWRB211	83.1	81.6	83.4	79.4	82.3	81.9	82.4	82.0	**82.0**
8	DWRB212	80.1	75.0	78.9	71.1	78.0	77.3	81.1	81.1	**77.8**
9	PL912	78.5	78.3	78.3	78.8	75.8	81.6	82.5	77.1	**78.9**
10	PL916	80.1	82.5	79.1	76.7	80.7	80.8	81.3	80.6	**80.2**
11	PL919	79.1	82.1	75.4	79.9	78.0	81.4	78.9	80.5	**79.4**
12	RD3023	78.1	81.9	72.6	82.3	77.9	77.3	82.5	80.7	**79.2**
13	RD3024	82.9	83.0	81.2	77.4	82.3	77.8	82.3	79.8	**80.8**
14	RD3025	82.0	83.1	79.9	81.6	82.0	78.8	76.2	74.1	**79.7**
15	RD3026	74.4	81.7	71.9	77.3	80.6	78.5	81.6	80.6	**78.3**
16	UPB1089	76.4	81.6	79.5	79.0	79.2	82.7	80.6	80.1	**79.9**
17	UPB1090	78.6	83.6	78.2	79.4	81.3	80.1	82.9	82.3	**80.8**
18	BH946(C)*	79.9	77.0	79.3	74.6	79.7	80.8	80.7	78.9	**78.9**
19	DWRB101(C)	80.0	80.1	79.3	79.7	79.9	81.9	81.7	81.5	**80.5**
20	DWRB123(C)	75.2	78.5	77.1	77.9	80.6	82.3	82.3	78.3	**79.0**
21	DWRB160(C)	79.3	80.2	79.5	79.1	80.8	82.5	79.1	75.7	**79.5**
22	RD2849 (C)	78.6	80.7	76.1	79.3	80.7	82.6	81.6	79.4	**79.9**
	Mean	**79.3**	**80.8**	**78.6**	**78.3**	**80.2**	**80.2**	**81.2**	**79.8**	

*= 6 row barley

Table 2.12 b : Wort filtration rate (ml/hr) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	280	280	310	280	115	270	260	290	**261**
2	BH1026	200	250	115	210	150	145	160	200	**179**
3	BH1027	250	290	280	150	130	160	240	250	**219**
4	BH1028	230	250	260	240	220	170	270	240	**235**
5	DWRB209	290	260	280	260	230	240	250	270	**260**
6	DWRB210	260	250	240	260	220	270	200	250	**244**
7	DWRB211	260	270	290	250	230	230	220	260	**251**
8	DWRB212	250	280	270	170	150	170	150	230	**209**
9	PL912	230	260	250	240	220	230	220	280	**241**
10	PL916	270	280	220	280	220	230	170	260	**241**
11	PL919	270	260	230	260	230	250	230	230	**245**
12	RD3023	240	260	250	260	180	240	240	240	**239**
13	RD3024	250	260	270	140	250	200	220	280	**234**
14	RD3025	260	280	280	230	230	250	225	280	**254**
15	RD3026	250	240	240	200	210	210	230	230	**226**
16	UPB1089	240	250	230	240	270	260	160	260	**239**
17	UPB1090	240	220	150	200	120	250	210	270	**208**
18	BH946(C)*	210	240	180	230	150	200	160	230	**200**
19	DWRB101(C)	270	270	270	270	280	200	200	260	**253**
20	DWRB123(C)	230	250	270	250	150	260	210	260	**235**
21	DWRB160(C)	220	240	240	220	150	240	210	230	**219**
22	RD2849 (C)	260	260	270	270	220	280	170	260	**249**
	Mean	**248**	**259**	**245**	**232**	**197**	**225**	**209**	**253**	

*= 6 row barley

Table 2.13 b : Saccharification rate (minutes) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	5.0	10.0	5.0	5.0	10.0	5.0	5.0	5.0	**6.3**
2	BH1026	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.0**
3	BH1027	10.0	5.0	10.0	5.0	10.0	5.0	5.0	5.0	**6.9**
4	BH1028	5.0	5.0	10.0	10.0	5.0	5.0	5.0	5.0	**6.3**
5	DWRB209	5.0	5.0	5.0	5.0	5.0	5.0	10.0	5.0	**5.6**
6	DWRB210	5.0	5.0	10.0	5.0	5.0	5.0	5.0	5.0	**5.6**
7	DWRB211	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.0**
8	DWRB212	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.0**
9	PL912	5.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	**5.6**
10	PL916	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.0**
11	PL919	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.0**
12	RD3023	5.0	5.0	5.0	5.0	5.0	5.0	10.0	10.0	**6.3**
13	RD3024	5.0	10.0	5.0	10.0	5.0	5.0	5.0	5.0	**6.3**
14	RD3025	5.0	5.0	5.0	5.0	10.0	10.0	5.0	5.0	**6.3**
15	RD3026	10.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0	**6.3**
16	UPB1089	5.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	**5.6**
17	UPB1090	10.0	5.0	10.0	10.0	5.0	5.0	10.0	5.0	**7.5**
18	BH946(C)*	5.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.6**
19	DWRB101(C)	5.0	5.0	5.0	10.0	5.0	5.0	5.0	10.0	**6.3**
20	DWRB123(C)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	**5.0**
21	DWRB160(C)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	**5.6**
22	RD2849 (C)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	5.0	**5.6**
	Mean	**5.7**	**5.7**	**5.9**	**6.1**	**6.1**	**5.2**	**5.9**	**5.7**	

*= 6 row barley

Table 2.14 b : Wort pH of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	6.2	6.2	6.1	6.3	6.3	6.4	6.2	6.4	**6.3**
2	BH1026	6.1	6.2	6.2	6.2	6.2	6.4	6.3	6.2	**6.2**
3	BH1027	6.2	6.3	6.2	6.2	6.1	6.4	6.3	6.3	**6.2**
4	BH1028	6.2	6.2	6.2	6.2	6.0	6.4	6.2	6.2	**6.2**
5	DWRB209	6.2	6.2	6.3	6.2	6.2	6.4	6.3	6.3	**6.3**
6	DWRB210	6.2	6.3	6.1	6.0	6.1	6.4	6.4	6.2	**6.2**
7	DWRB211	6.2	6.3	6.3	6.1	6.1	6.4	6.2	6.2	**6.2**
8	DWRB212	6.1	6.2	6.2	6.1	6.0	6.3	6.2	6.2	**6.2**
9	PL912	6.2	6.2	6.2	6.0	6.2	6.4	6.3	6.1	**6.2**
10	PL916	6.2	6.2	6.2	6.1	6.1	6.3	6.2	6.2	**6.2**
11	PL919	6.2	6.2	6.1	6.1	6.2	6.3	6.1	6.2	**6.2**
12	RD3023	6.3	6.3	6.2	6.2	6.2	6.5	6.3	6.3	**6.3**
13	RD3024	6.2	6.3	6.2	6.1	6.1	6.4	6.1	6.2	**6.2**
14	RD3025	6.1	6.3	6.2	6.2	6.2	6.3	8.2	6.3	**6.5**
15	RD3026	6.2	6.3	6.3	6.2	6.2	6.4	6.2	6.3	**6.3**
16	UPB1089	6.3	6.4	6.4	6.3	6.3	6.4	6.3	6.4	**6.3**
17	UPB1090	6.3	6.4	6.3	6.3	6.3	6.4	6.1	6.4	**6.3**
18	BH946(C)*	6.2	6.3	6.3	6.2	6.1	6.4	6.2	6.3	**6.3**
19	DWRB101(C)	6.2	6.2	6.1	6.0	6.1	6.3	6.2	6.1	**6.1**
20	DWRB123(C)	6.2	6.3	6.1	5.9	6.1	6.4	6.2	6.0	**6.1**
21	DWRB160(C)	6.3	6.3	6.3	6.1	6.2	6.4	6.2	6.3	**6.2**
22	RD2849 (C)	6.1	6.2	6.1	6.1	6.1	6.3	6.2	6.1	**6.1**
	Mean	**6.2**	**6.3**	**6.2**	**6.1**	**6.2**	**6.4**	**6.3**	**6.2**	

*= 6 row barley

Table 2.15 b : Diastatic power (°L) of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	87	97	78	102	60	94	68	98	**86**
2	BH1026	90	104	94	101	89	85	86	89	**92**
3	BH1027	98	99	104	101	82	78	106	90	**95**
4	BH1028	74	77	66	79	66	62	83	85	**74**
5	DWRB209	99	89	77	78	79	70	99	76	**84**
6	DWRB210	89	86	79	85	91	72	89	71	**83**
7	DWRB211	80	82	116	58	79	86	74	81	**82**
8	DWRB212	100	106	82	64	63	67	68	66	**77**
9	PL912	77	67	60	58	58	52	53	72	**62**
10	PL916	88	109	99	102	93	93	91	88	**95**
11	PL919	99	91	94	103	61	78	51	99	**85**
12	RD3023	81	72	90	71	81	68	99	96	**82**
13	RD3024	83	87	81	72	71	69	55	75	**74**
14	RD3025	91	85	89	89	65	72	86	74	**81**
15	RD3026	91	85	79	93	83	55	84	77	**81**
16	UPB1089	98	80	68	75	74	59	89	68	**76**
17	UPB1090	98	94	81	83	94	79	77	76	**85**
18	BH946(C)*	71	89	96	85	54	75	66	70	**76**
19	DWRB101(C)	68	62	68	77	57	57	61	55	**63**
20	DWRB123(C)	83	62	62	60	66	70	98	61	**70**
21	DWRB160(C)	100	86	94	93	72	71	78	86	**85**
22	RD2849 (C)	74	55	60	76	55	52	52	54	**60**
	Mean	**87**	**85**	**83**	**82**	**72**	**71**	**78**	**78**	

*= 6 row barley

Table 2.16 b : Kolbach Index (KI) # of IVT (MB) entries from different locations

S.N.	Genotype	Karnal	Hisar	Durgapura	Modipuram	Ludhiana	Pantnagar	Bawal	Bhatinda	Mean
1	ABI Kranti	36	39	38	36	38	41	37	38	**38**
2	BH1026	38	43	37	34	38	40	40	40	**39**
3	BH1027	39	38	39	39	46	42	38	38	**40**
4	BH1028	39	37	36	41	36	40	40	37	**38**
5	DWRB209	36	37	37	39	37	39	39	40	**38**
6	DWRB210	42	39	39	36	37	41	39	36	**38**
7	DWRB211	38	40	36	37	38	39	40	39	**38**
8	DWRB212	41	38	38	39	38	41	39	40	**39**
9	PL912	38	41	39	39	36	39	40	43	**39**
10	PL916	39	43	38	37	41	39	37	40	**39**
11	PL919	42	42	39	39	41	42	37	39	**40**
12	RD3023	40	41	41	42	37	38	41	38	**40**
13	RD3024	39	40	35	42	38	40	40	37	**39**
14	RD3025	35	44	39	39	39	41	41	38	**40**
15	RD3026	39	40	37	36	36	43	39	39	**39**
16	UPB1089	42	40	40	41	39	42	34	41	**40**
17	UPB1090	45	37	37	36	40	40	39	37	**39**
18	BH946(C)*	36	41	38	37	39	43	39	40	**39**
19	DWRB101(C)	32	42	36	38	39	42	38	36	**38**
20	DWRB123(C)	37	37	38	35	41	38	38	37	**38**
21	DWRB160(C)	37	42	38	34	37	38	38	37	**38**
22	RD2849 (C)	32	41	38	39	41	42	38	42	**39**
	Mean	**38**	**40**	**38**	**38**	**39**	**40**	**39**	**39**	

*= 6 row barley

Tables 2.17 b & 2.18 b: Wort FAN (ppm) and wort β- glucan content (ppm) of IVT (MB) entries *

S.N.	Genotype	Karnal	Hisar	Mean	Karnal	Hisar	Mean
1	ABI Kranti	271	204	**237**	157	98	**128**
2	DWRB211	194	139	**166**	184	116	**150**
3	RD3025	265	190	**228**	303	276	**289**
4	DWRB101(C)	237	206	**221**	425	259	**342**
5	DWRB123(C)	177	184	**181**	546	301	**423**
6	DWRB160(C)	171	210	**190**	993	419	**706**
7	RD2849 (C)	210	211	**210**	466	240	**353**
	Mean	**218**	**192**		**439**	**244**	

**Done for selected entries and 2 row checks because of paucity of time. Entries were selected having low β- glucan content in grain*

Barley quality screening nursery

The *Barley Quality Screening Nursery* was conducted for finding better sources of hulless and malt barley for different quality traits. The Nursery was conducted at five locations i.e. Karnal, Hisar, Kanpur, Ludhiana and Pantnagar. The quantity of grains obtained for hulless barley was either too less or missing for some entries at certain locations that analysis could not be done. The smaller quantity material has been kept for analyzing some of the biochemical traits and will be reported in institute report and next year's AICRP report. For malt quality traits also, there was problem of grain quantity, however sufficient grains have been obtained from Karnal, for which malt quality analysis has also been done. The grain physical parameters have been analyzed for Karnal, Hisar and Pantnagar.

The results of different quality traits screening are presented below:

Table 1. Promising sources for different traits*

Traits	Promising entries
Hectoliter Weight**	BCU 4966, DWR 49
Thousand grain weight (42-48 g)**	ICARDA-5. ICARDA-28, ICARDA-18, ICARDA-1, BK-306, ICARDA-8, ICARDA-12, ICARDA-17, BCU 2030, ICARDA-9
Bold Grains**	BCU 2241
Protein content (12-13%)**	BCU-4966, ICARDA-27, ICARDA-26
Starch content**	BK-306, ICARDA-9, ICARDA-8
Grain B- glucan***	ICARDA-5
Malt Friability (> 65%)***	ICARDA-8, ICARDA-9, ICARDA-11
Hot water extract***	ICARDA-9
Filtration Rate***	ICARDA-9, DWR 49, ICARDA-11
Diastatic Power***	BK-306, ICARDA-11, DWR 49, ICARDA-8, ICARDA-9, ICARDA-4, ICARDA-28
Kolbach Index	ICARDA-4, ICARDA-17, ICARDA-8, ICARDA-11

Better than checks ** Based on mean of three locations (Hisar, Karnal and Pantnagar)
****** Karnal location only***

Table 2: Hectoliter weight (Test weight in kg/hl) and 1000 gw of genotypes from different locations

SN	Genotype	Hectoliter/Test weight (kg/hl)				1000 gw *(g)*			
		Hisar	Karnal	Pantnagar	Mean	Hisar	Karnal	Pantnagar	Mean
1	BCU2030*	57.6	54.1	44.8	**52.2**	51.6	42.1	44.6	**46.1**
2	BCU2241	55.4	65.0	59.1	**59.9**	63.2	57.4	59.7	**60.1**
3	BCU-4966	61.0	69.8	64.0	**64.9**	58.3	59.3	56.7	**58.1**
4	BK 306	57.4	63.7	63.2	**61.5**	48.3	39.1	46.9	**44.7**
5	BK-1127	57.3	68.8	59.8	**62.0**	53.8	61.5	67.6	**61.0**
6	DWR49	61.8	67.0	61.9	**63.6**	55.4	48.9	52.6	**52.3**
7	DWRB184	59.3	63.4	60.4	**61.1**	57.2	46.8	53.9	**52.6**
8	ICARDA-1	57.4	50.6	60.0	**56.0**	45.4	45.8	42.4	**44.6**
9	ICARDA-4*	56.3	59.8	56.8	**57.6**	36.1	38.6	42.6	**39.1**
10	ICARDA-5	56.2	56.0	60.3	**57.5**	52.6	35.0	38.9	**42.2**
11	ICARDA-8	58.3	67.0	60.5	**61.9**	42.2	36.8	56.6	**45.2**
12	ICARDA-9	60.2	61.3	62.8	**61.4**	50.7	43.5	45.9	**46.7**
13	ICARDA-11*	54.7	65.3	56.4	**58.8**	38.8	27.0	37.6	**34.5**
14	ICARDA-12	61.5	64.8	55.9	**60.7**	51.5	41.6	43.2	**45.4**
15	ICARDA-17*	53.3	61.2	55.2	**56.6**	47.7	43.1	47.1	**46.0**
16	ICARDA-18*	56.1	55.6	54.0	**55.2**	43.0	43.0	46.3	**44.1**
17	ICARDA-19*	54.1	52.2	59.1	**55.1**	37.1	33.5	41.7	**37.4**
18	ICARDA-26*	53.5	60.1	56.2	**56.6**	41.8	33.6	42.7	**39.4**
19	ICARDA-27*	56.1	63.9	56.8	**58.9**	41.9	35.7	42.6	**40.1**
20	ICARDA-28*	53.7	59.5	55.3	**56.2**	44.0	40.1	44.8	**42.9**
21	K-647	53.1	56.8	55.2	**55.0**	56.9	46.0	56.5	**53.1**
22	DWRUB52 ©	60.7	66.7	60.5	**62.7**	56.1	40.5	47.1	**47.9**
23	DWRB91 ©	62.0	66.9	60.6	**63.2**	61.1	55.6	62.8	**59.8**
24	DWRB92 ©	56.5	61.3	59.6	**59.1**	64.2	54.5	56.7	**58.5**
25	DWRB101 ©	60.6	66.5	63.0	**63.3**	52.9	47.9	50.1	**50.3**
26	DWRB123 ©	57.5	62.6	63.2	**61.1**	57.8	53.1	51.3	**54.1**
27	DWRB160 ©	58.7	62.2	57.5	**59.5**	70.8	65.0	69.0	**68.3**
28	DWRB182 ©	55.9	62.3	57.7	**58.6**	43.0	41.2	39.9	**41.4**
Mean		**57.4**	**61.9**	**58.6**		**50.8**	**44.9**	**49.6**	

**Six row entries*

Table 3: Bold & Thin grain percentage of BQSN genotypes from different locations

SN	Genotype	*Bold (retained on 2.5 mm)*				*Thin (passed through 2.2 mm)*			
		Hisar	**Karnal**	**Pantnagar**	**Mean**	**Hisar**	**Karnal**	**Pantnagar**	**Mean**
1	BCU2030*	90.6	65.3	75.8	**77.2**	1.6	11.6	7.3	**6.8**
2	BCU2241	98.0	97.7	98.5	**98.1**	0.2	4.0	0.4	**1.5**
3	BCU-4966	98.1	96.0	96.9	**97.0**	0.4	0.3	0.8	**0.5**
4	BK 306	96.2	78.5	95.5	**90.1**	0.5	4.5	0.9	**2.0**
5	BK-1127	95.4	98.1	97.8	**97.1**	0.5	1.0	0.9	**0.8**
6	DWR49	94.1	84.1	93.1	**90.4**	1.0	2.9	1.4	**1.8**
7	DWRB184	97.2	91.2	98.1	**95.5**	0.5	3.8	0.5	**1.6**
8	ICARDA-1	89.0	81.0	80.3	**83.4**	2.0	5.8	4.5	**4.1**
9	ICARDA-4*	77.5	78.4	84.8	**80.3**	2.8	5.0	4.0	**3.9**
10	ICARDA-5	93.3	48.4	72.8	**71.5**	0.4	26.4	6.3	**11.0**
11	ICARDA-8	87.6	95.3	96.1	**93.0**	2.0	0.2	0.6	**0.9**
12	ICARDA-9	92.3	54.3	92.4	**79.7**	1.0	23.1	1.3	**8.5**
13	ICARDA-11*	82.2	72.0	81.1	**78.4**	4.0	11.8	5.2	**7.0**
14	ICARDA-12	96.8	82.5	80.8	**86.7**	0.4	7.8	3.8	**4.0**
15	ICARDA-17*	94.2	79.8	91.5	**88.5**	0.8	6.3	1.4	**2.8**
16	ICARDA-18*	93.8	76.8	93.8	**88.2**	0.6	5.6	1.1	**2.4**
17	ICARDA-19*	74.2	63.1	79.5	**72.3**	2.9	11.4	3.2	**5.9**
18	ICARDA-26*	84.1	88.6	80.4	**84.4**	1.7	6.4	2.6	**3.6**
19	ICARDA-27*	88.4	71.3	85.7	**81.8**	1.1	8.6	2.0	**3.9**
20	ICARDA-28*	94.9	82.0	94.4	**90.4**	0.4	7.1	1.2	**2.9**
21	K-647	94.1	57.6	91.9	**81.2**	0.8	13.9	1.2	**5.3**
22	DWRUB52 ©	97.9	76.0	89.0	**87.6**	0.2	7.2	1.4	**2.9**
23	DWRB91 ©	98.0	85.6	96.2	**93.3**	0.5	4.0	0.9	**1.8**
24	DWRB92 ©	98.7	89.5	97.4	**95.2**	0.1	2.2	0.8	**1.0**
25	DWRB101 ©	97.1	79.9	95.7	**90.9**	0.2	5.4	0.6	**2.1**
26	DWRB123 ©	98.3	81.3	94.5	**91.4**	0.4	3.7	1.3	**1.8**
27	DWRB160 ©	98.7	95.6	99.0	**97.8**	0.2	0.7	0.5	**0.5**
28	DWRB182 ©	93.2	75.9	68.8	**79.3**	0.7	6.6	6.5	**4.6**
Mean		**92.6**	**79.5**	**89.4**			**1.0**	**7.0**	**2.2**

**Six row entries*

Table 4: Protein & starch content (%db) of genotypes from different locations#

SN	Genotype	Protein content (%db				Starch content (%db)			
		Hisar	Karnal	Pantnagar	Mean	Hisar	Karnal	Pantnagar	Mean
1	BCU-2030*	12.5	11.3	11.9	**11.9**	59.6	59.3	59.8	**59.6**
2	BCU-2241	13.9	11.1	11.0	**12.0**	60.4	61.2	60.7	**60.8**
3	BCU-4966	13.9	11.4	12.3	**12.5**	61.5	59.3	60.8	**60.5**
4	BK-306	12.1	10.5	9.2	**10.6**	63.2	60.9	63.0	**62.4**
5	BK-1127	14.6	13.0	13.6	**13.7**	60.7	58.9	59.7	**59.8**
6	DWR49	15.0	13.5	10.8	**13.1**	60.3	60.5	61.2	**60.7**
7	DWRB184	13.0	11.3	9.4	**11.2**	60.8	60.4	61.7	**61.0**
8	ICARDA-1	11.4	9.1	9.5	**10.0**	62.9	60.1	62.3	**61.8**
9	ICARDA-4*	10.5	8.7	10.3	**9.8**	61.0	61.4	61.2	**61.2**
10	ICARDA-5	13.5	11.1	10.6	**11.7**	59.7	58.9	62.1	**60.2**
11	ICARDA-8	13.0	10.0	9.9	**11.0**	61.6	61.7	61.1	**61.5**
12	ICARDA-9	11.5	9.8	9.8	**10.4**	63.3	60.8	62.3	**62.1**
13	ICARDA-11*	12.9	10.5	11.1	**11.5**	60.6	60.4	60.6	**60.5**
14	ICARDA-12	12.2	11.0	9.5	**10.9**	61.8	61.0	60.7	**61.2**
15	ICARDA-17*	12.0	11.3	11.4	**11.6**	61.4	59.5	59.9	**60.3**
16	ICARDA-18*	13.1	10.2	10.6	**11.3**	60.2	60.0	60.2	**60.1**
17	ICARDA-19*	11.8	10.5	9.8	**10.7**	61.3	59.6	61.0	**60.6**
18	ICARDA-26*	13.4	11.6	11.2	**12.1**	59.2	59.5	60.0	**59.6**
19	ICARDA-27*	13.5	11.8	11.8	**12.4**	60.5	59.8	59.2	**59.8**
20	ICARDA-28*	12.2	10.1	9.5	**10.6**	59.6	60.5	60.1	**60.1**
21	K-647	15.8	13.6	10.8	**13.4**	59.3	59.0	60.7	**59.7**
22	DWRUB52 ©	13.4	10.6	9.8	**11.3**	61.1	61.1	61.6	**61.3**
23	DWRB91 ©	11.9	11.2	9.5	**10.9**	62.7	59.6	61.6	**61.3**
24	DWRB92 ©	14.9	11.9	11.5	**12.8**	60.4	60.5	60.9	**60.6**
25	DWRB101 ©	13.0	11.1	10.2	**11.4**	61.6	60.5	62.0	**61.4**
26	DWRB123 ©	13.3	10.4	9.8	**11.2**	59.3	59.8	62.5	**60.5**
27	DWRB160 ©	11.6	11.1	9.8	**10.8**	61.7	60.0	61.1	**60.9**
28	DWRB182 ©	12.8	11.7	11.5	**12.0**	61.1	60.3	60.2	**60.5**
Mean		**13.0**	**11.1**	**10.6**		**61.0**	**60.2**	**61.0**	

*#Predicted values through NIR *Six row entries*

Table 5: Grain β-glucan and some of the malt quality traits of genotypes from Karnal location

S. No	Genotype	β-G	FRIA	HOMO	FR	HWE	DP	KI#
1	BCU-2030*	4.4	35	65	240	77.5	106	39
2	BCU-2241	4.2	43	79	265	79.4	104	36
3	BCU-4966	6.6	44	72	230	76.7	106	37
4	BK-306	4.5	65	94	270	82.6	120	40
5	BK-1127	6.2	36	59	210	80.9	105	36
6	DWR49	5.2	20	29	310	73.0	118	34
7	DWRB184	5.3	36	80	225	82.1	96	40
8	ICARDA-1	4.4	57	80	280	80.6	99	37
9	ICARDA-4*	5.6	57	98	230	82.3	114	44
10	ICARDA-5	2.9	NA	NA	280	82.1	99	38
11	ICARDA-8	4.2	77	95	270	82.3	116	42
12	ICARDA-9	3.8	70	92	310	82.8	114	38
13	ICARDA-11*	3.4	66	95	300	80.9	118	41
14	ICARDA-12	5.8	42	62	240	82.3	104	38
15	ICARDA-17*	5.7	60	85	240	79.1	103	43
16	ICARDA-18*	4.9	48	69	230	82.6	95	37
17	ICARDA-19*	6.2	51	88	220	82.6	102	38
18	ICARDA-26*	4.7	48	66	230	81.4	106	39
19	ICARDA-27*	4.7	47	81	250	81.6	111	39
20	ICARDA-28*	5.2	50	71	270	79.9	114	38
21	K-647	4.9	45	84	110	76.5	106	36
22	DWRUB52 ©	4.9	41	72	280	80.6	68	35
23	DWRB91 ©	5.3	50	82	235	82.6	109	38
24	DWRB92 ©	4.2	39	60	280	82.0	112	37
25	DWRB101 ©	4.7	48	84	215	80.4	64	40
26	DWRB123 ©	4.6	38	72	210	81.6	76	37
27	DWRB160 ©	5.7	34	63	210	82.3	90	37
28	DWRB182 ©	3.3	56	80	285	80.1	100	38

**Six row entries*

Abbreviations: β-G= Grain Beta Glucan content (%db); FRIA=Friability (%); HOMO=Homogeneity (%); FR=Filtration rate (ml/hr); HWE= Hot Water Extract (%fgdb); DP= Diastatic Power in Degree Linters; KI= Kolbach Index (%)

FEED BARLEY QUALITY EVALUATION

The feed grain samples from various trials grown at different locations were analyzed for physical parameters and protein content. Each center was requested to provide a grain sample of 250 g. The parameters analyzed included test weight (kg/hl), thousand grain weight (g), grain plumpness and grain crude protein content (%). The details of samples received are as under:

Table-1 Details of grain samples received and analyzed for quality

Trial	Zone	Locations	Total No. , PL of Samples
IVT FB (IR)	NWPZ/NEPZ/CZ	Hisar, Modipuram, Durgapura, Karnal, Pantnagar, Ludhiana, Udaipur, Gwalior, Vijapur, Kanpur, Varanasi, Bhagalpur	300
AVT FB (IR)	NWPZ/CZ	Hisar, Modipuram, Durgapura, Karnal, Pantnagar, Ludhiana, Udaipur	56
IVT/AVT (HL)	NWPZ/NEPZ/CZ	Hisar, Modipuram, Durgapura, Karnal, Pantnagar; Ludhiana, Gwalior, Vijapur, Udaipur, Kanpur, Varanasi	110
IVT (RF)	NEPZ	Kanpur, Varanasi, Bhagalpur	45
AVT (SAL/ALK)	NWPZ/NEPZ	Hisar (HAU), Hisar (IIWBR)*, Rampur, Fatehpur, Kanpur	90
AVT-RF	NHZ	Almora, Majhera, Malan, Shimla, Bajaura**	110
		TOTAL	**711**

*Results not reported as analysis under progress ** Samples got spoiled and thus not analyzed

Hectoliter weight (test weight) was measured with ICAR-IIWBR Hectoliter Weight instrument. The crude protein content was estimated using FOSS NIR system and has been given on dry weight basis. *The higher protein content should be seen in conjunction with thin grain percentage as usually thin grains have higher values for protein, therefore it is not given in table 2.* The quality data has been presented trial wise (Annexure 1). The entries having highest test weight; grain plumpness and thousand grain weight have been listed in table no.2.

Table 2. Entries with better values for individual grain quality traits in respective trials

Trial	Test weight (kg/hl)	Thousand grain weight (g)	Bold grain (%)	Thin grain (%)	Grain Protein (%)
IVT FB (IR)	PL 920	HUB 271	DWRB 137 (c)	DWRB 137 (c)	UPB1087, PL920
AVT FB (IR)-NWPZ	RD 2994, UPB 1080	RD 2994	RD 2994	RD 2994	-
IVT/AVT (HL)	K 1149	PL 891 (c)	DWRB 204, DWRB 217	DWRB 204, DWRB 217	DWRB 217
IVT (RF)-NEPZ	NDB 1748, PL 925	HUB 69, PL 925	DWRB 213, PL 918, HUB 69, RD 3022, RD 3019, RD 3021, RD 3020, PL 925, HUB 270, NDB 1748	DWRB 213, PL 918, HUB 69, RD 3022, RD 3019, RD 3020, PL 925, HUB 270, NDB 1748	PL 918, PL 925
AVT (SAL/ ALK)	KB 1845, RD 3015, HUB 273, BH 1032, RD 3018	RD 3015, HUB 273, NDB 1742, DWRB 214, RD 3016, BH 1033, KB 1815	HUB 273	HUB 273	KB1845, NDB 1730
AVT-RF-NHZ	BHS 352 (c)	VLB 118 (c)	VLB 118 (c)	VLB 118 (c)	BHS 482

Annexure -1

IVT-IR-TS-FB - NWPZ/NEPZ/CZ

Table 1: Test weight (kg/hl) of genotype in IVT Feed Barley (Irrigated Condition) at different locations

S	Genotype	H	M	D	K	P	L	M 1	U	G	V	M2	K	V	B	M3	OM
1	BH1029	54.6	53.5	57.7	52.4	48.9	57.8	**54.1**	62.8	49.9	51.6	**54.8**	54.6	53.3	43.7	**50.5**	**53.1**
2	BH1030	59.6	54.2	62.3	55.3	52.4	56.8	**56.8**	62.2	53.4	48.0	**54.5**	56.9	44.3	38.3	**46.5**	**52.6**
3	BH1031	56.7	55.8	62.7	57.4	57.8	59.5	**58.3**	63.9	56.3	57.9	**59.4**	56.9	49.1	45.5	**50.5**	**56.1**
4	DWRB215	56.8	55.5	61.0	53.7	52.4	60.7	**56.7**	60.7	54.5	56.4	**57.2**	55.0	52.9	39.4	**49.1**	**54.3**
5	HUB271	55.1	52.1	56.6	49.8	53.6	62.2	**54.9**	61.8	51.8	59.7	**57.8**	56.2	46.8	45.8	**49.6**	**54.1**
6	HUB272	58.4	52.5	60.5	58.7	57.8	59.9	**58.0**	62.9	54.0	56.0	**57.6**	57.5	52.5	46.5	**52.2**	**55.9**
7	KB1816	62.1	55.8	62.2	55.1	60.9	58.7	**59.2**	63.7	59.6	63.3	**62.2**	59.4	53.4	46.9	**53.2**	**58.2**
8	KB1817	56.8	53.5	60.7	53.3	59.8	57.8	**57.0**	63.9	50.7	55.7	**56.8**	56.5	48.1	42.7	**49.1**	**54.3**
9	KB1822	53.5	48.1	61.5	52.6	49.1	60.6	**54.2**	61.7	54.0	52.7	**56.1**	54.3	47.4	42.3	**48.0**	**52.8**
10	NDB1738	58.4	56.0	57.4	58.2	55.6	59.4	**57.5**	67.3	57.4	57.1	**60.6**	56.1	46.7	45.2	**49.3**	**55.8**
11	PL911	61.6	57.8	62.1	55.1	57.6	68.1	**60.4**	62.4	58.3	61.2	**60.6**	58.6	54.3	44.8	**52.5**	**57.8**
12	PL915	59.0	55.2	65.8	52.7	54.8	59.8	**57.9**	68.8	56.1	64.7	**63.2**	59.7	52.6	47.4	**53.2**	**58.1**
13	PL917	57.2	50.5	61.4	53.4	50.3	65.9	**56.4**	65.1	53.3	59.0	**59.2**	56.0	46.2	43.0	**48.4**	**54.7**
14	PL920	62.2	55.2	65.8	58.9	57.4	65.2	**60.8**	68.5	58.8	63.3	**63.6**	60.1	53.2	42.4	**51.9**	**58.7**
15	RD3011	59.0	54.1	63.0	54.5	57.9	62.9	**58.6**	63.6	53.7	61.8	**59.7**	58.5	54.7	44.5	**52.6**	**56.9**
16	RD3012	58.1	55.6	63.2	55.3	55.8	70.4	**59.7**	64.6	54.6	63.2	**60.8**	60.0	53.2	43.8	**52.3**	**57.6**
17	RD3013	59.0	55.2	60.6	56.7	58.5	63.2	**58.9**	62.6	52.8	62.2	**59.2**	60.5	48.1	47.9	**52.2**	**56.7**
18	RD3014	60.5	54.3	63.6	54.7	59.0	62.6	**59.1**	66.9	57.6	58.5	**61.0**	59.0	53.4	45.2	**52.5**	**57.6**
19	UPB1087	59.1	52.5	63.6	55.2	54.8	58.9	**57.3**	65.5	56.2	61.3	**61.0**	57.3	52.5	42.8	**50.8**	**56.4**
20	UPB1088	59.3	54.4	62.7	58.6	57.6	59.7	**58.7**	64.2	57.1	62.2	**61.2**	59.0	45.7	42.5	**49.1**	**56.3**
21	BH 946 (C)	58.3	53.9	62.0	53.3	53.9	61.2	**57.1**	64.7	53.8	58.0	**58.8**	55.6	47.1	42.4	**48.4**	**54.8**
22	BH902(C)	57.0	54.8	62.1	56.3	56.7	64.4	**58.5**	66.3	56.8	53.1	**58.7**	57.5	49.1	46.6	**51.1**	**56.1**
23	DWRB137(C)	58.4	55.0	61.9	58.2	58.6	62.7	**59.1**	64.7	55.4	62.1	**60.7**	57.8	56.8	49.7	**54.7**	**58.2**
24	RD2552 (C)	53.0	51.7	62.0	55.4	54.7	62.5	**56.5**	64.1	55.8	57.8	**59.3**	55.4	51.7	41.8	**49.6**	**55.1**
25	RD2899(C)	55.8	54.2	63.0	51.9	52.7	63.3	**56.8**	71.1	54.6	56.8	**60.8**	57.2	49.2	43.7	**50.0**	**55.9**
	Mean	**58.0**	**54.1**	**61.8**	**55.1**	**55.6**	**61.8**		**64.6**	**55.1**	**58.5**		**57.4**	**50.5**	**44.2**		

S= Serial Number; H= Hisar; M= Modipuram; D= Durgapura; K= Karnal; P= Pantnagar; L= Ludhiana; M 1= Mean NWPZ; U= Udaipur; G = Gwalior; V = Vijapur; M 2= Mean CZ; K=Kanpur; V= Varanasi; B = Bhagalpur; M 3 = Mean NEPZ; OM=Overall Mean Across the Zones

Table 2: Thousand grain weight (grams) of genotype in IVT Feed Barley (Irrigated Condition) at different locations

S	Genotype	H	M	D	K	P	L	M 1	U	G	V	M2	K	V	B	M3	OM
1	BH1029	39.6	38.5	35.6	35.8	37.8	36.7	**37.3**	36.8	37.7	59.4	**44.6**	40.3	**45.7**	28.4	**38.1**	**40.0**
2	BH1030	47.0	41.1	43.0	38.8	40.8	31.4	**40.4**	38.6	40.4	44.1	**41.1**	44.1	**37.0**	42.9	**41.3**	**40.9**
3	BH1031	43.7	41.8	43.9	39.7	38.0	32.9	**40.0**	37.6	45.2	43.8	**42.2**	44.5	**41.4**	27.9	**37.9**	**40.0**
4	DWRB215	49.3	38.8	44.7	40.0	42.6	43.8	**43.2**	41.3	41.3	43.5	**42.0**	45.6	**43.5**	34.9	**41.3**	**42.2**
5	HUB271	44.1	42.8	47.2	39.5	51.6	27.1	**42.1**	36.2	46.8	63.7	**48.9**	64.8	**48.3**	28.4	**47.2**	**46.0**
6	HUB272	46.8	41.5	39.7	35.1	43.7	39.6	**41.1**	39.9	44.0	51.3	**45.0**	44.2	**46.9**	35.6	**42.2**	**42.8**
7	KB1816	38.7	32.5	35.1	36.6	40.7	29.7	**35.5**	36.1	42.3	44.0	**40.8**	42.3	**45.6**	30.6	**39.5**	**38.6**
8	KB1817	34.0	30.3	37.0	28.5	33.2	28.9	**32.0**	35.6	39.9	42.4	**39.3**	38.0	**39.5**	23.9	**33.8**	**35.0**
9	KB1822	44.2	38.9	35.5	35.5	52.2	27.1	**38.9**	35.7	38.9	37.1	**37.3**	40.9	**36.7**	28.5	**35.3**	**37.2**
10	NDB1738	44.9	36.1	39.4	39.0	34.1	28.6	**37.0**	37.1	43.4	44.4	**41.6**	43.5	**38.0**	30.3	**37.3**	**38.7**
11	PL911	43.9	37.9	32.4	36.3	36.6	33.5	**36.8**	45.4	40.9	41.7	**42.6**	42.0	**35.2**	34.0	**37.0**	**38.8**
12	PL915	40.3	35.0	36.5	33.4	72.1	30.7	**41.3**	35.1	40.1	42.4	**39.2**	39.4	**35.5**	27.2	**34.0**	**38.2**
13	PL917	34.4	34.7	39.2	30.6	32.3	27.2	**33.1**	38.5	34.6	43.1	**38.8**	34.7	**57.6**	29.3	**40.5**	**37.4**
14	PL920	46.9	33.8	39.9	37.1	33.1	30.2	**36.8**	45.4	44.0	42.2	**43.9**	41.3	**56.6**	25.1	**41.0**	**40.6**
15	RD3011	46.3	36.3	44.4	37.8	40.3	36.6	**40.3**	41.0	45.7	51.7	**46.1**	48.7	**41.2**	26.7	**38.9**	**41.8**
16	RD3012	43.7	37.5	42.6	35.4	44.0	35.8	**39.8**	36.2	39.5	49.5	**41.7**	43.1	**45.9**	28.8	**39.3**	**40.3**
17	RD3013	39.4	33.8	38.8	33.9	39.2	30.1	**35.9**	32.4	38.9	49.0	**40.1**	44.4	**43.8**	31.7	**39.9**	**38.6**
18	RD3014	39.2	37.8	34.0	32.0	38.0	29.9	**35.1**	30.1	32.4	43.0	**35.2**	40.9	**39.0**	31.8	**37.2**	**35.8**
19	UPB1087	43.5	37.1	44.2	39.0	42.6	35.4	**40.3**	42.0	43.3	43.8	**43.0**	44.7	**44.2**	29.5	**39.5**	**40.9**
20	UPB1088	42.0	35.6	38.2	33.3	34.4	27.0	**35.1**	38.7	38.8	46.0	**41.2**	41.0	**36.0**	45.5	**40.8**	**39.0**
21	BH 946 (C)	43.4	38.8	45.9	36.6	44.9	30.6	**40.0**	37.5	44.8	51.2	**44.5**	43.0	**37.6**	27.6	**36.1**	**40.2**
22	BH902(C)	45.2	38.0	44.1	38.5	41.7	29.6	**39.5**	44.7	44.8	48.2	**45.9**	45.8	**40.1**	28.1	**38.0**	**41.1**
23	DWRB137(C)	47.8	37.8	45.2	44.6	46.3	36.5	**43.0**	41.3	42.9	49.0	**44.4**	46.0	**52.3**	39.3	**45.9**	**44.4**
24	RD2552 (C)	44.7	34.9	39.7	31.7	37.8	28.0	**36.1**	37.1	43.3	43.9	**41.4**	43.2	**38.0**	23.4	**34.8**	**37.5**
25	RD2899(C)	47.0	41.4	49.4	34.5	42.9	33.3	**41.4**	40.9	48.1	47.1	**45.4**	45.8	**50.4**	28.4	**41.5**	**42.8**
	Mean	**43.2**	**37.3**	**40.6**	**36.1**	**41.6**	**32.0**		**38.5**	**41.7**	**46.6**		**43.7**	**43.0**	**30.7**		

S= Serial Number; H= Hisar; M= Modipuram; D= Durgapura; K= Karnal; P= Pantnagar; L= Ludhiana; M 1= Mean NWPZ; U= Udaipur; G = Gwalior; V = Vijapur; M 2= Mean CZ; K=Kanpur; V= Varanasi; B = Bhagalpur; M 3 = Mean NEPZ; OM=Overall Mean Across the Zones

Table 3: Bold grain percentage (grains retained over 2.5 mm screen) of genotype in IVT Feed Barley (Irrigated Condition) at different locations

S	Genotype	H	M	D	K	P	L	M 1	U	G	V	M2	K	V	B	M3	OM
1	BH1029	89.3	86.1	65.4	82.2	80.1	83.9	**81.2**	82.6	80.0	89.7	**84.1**	95.1	89.7	48.3	**77.7**	**81.0**
2	BH1030	80.0	80.9	76.6	78.8	78.1	61.1	**75.9**	67.2	83.1	87.4	**79.2**	88.7	82.2	36.1	**69.0**	**74.7**
3	BH1031	91.8	87.4	87.2	83.2	66.9	64.2	**80.1**	76.7	93.1	81.9	**83.9**	95.8	87.7	42.1	**75.2**	**79.7**
4	DWRB215	91.5	87.3	88.6	81.6	72.0	59.1	**80.0**	64.8	91.4	82.7	**79.6**	97.4	93.2	36.7	**75.8**	**78.5**
5	HUB271	90.1	83.7	61.4	63.3	83.1	77.7	**76.5**	69.5	86.4	94.3	**83.4**	95.1	88.8	76.5	**86.8**	**82.2**
6	HUB272	79.8	58.2	58.0	72.7	79.0	53.7	**66.9**	64.3	81.1	81.5	**75.6**	93.2	85.7	32.0	**70.3**	**70.9**
7	KB1816	73.5	58.3	59.7	49.6	73.5	55.5	**61.7**	58.1	84.2	75.8	**72.7**	91.7	71.4	37.3	**66.8**	**67.1**
8	KB1817	82.5	87.0	50.1	76.8	67.5	44.3	**68.0**	74.3	73.4	61.1	**69.6**	95.3	69.7	28.3	**64.4**	**67.4**
9	KB1822	90.8	78.4	82.5	81.5	58.9	56.2	**74.7**	81.9	93.2	87.2	**87.4**	97.0	88.8	40.6	**75.4**	**79.2**
10	NDB1738	84.3	82.8	45.6	79.2	71.1	75.7	**73.1**	79.9	86.0	77.9	**81.2**	94.1	80.7	62.5	**79.1**	**77.8**
11	PL911	83.2	70.6	65.5	62.8	58.9	59.8	**66.8**	60.4	87.9	79.8	**76.0**	86.8	77.9	26.8	**63.8**	**68.9**
12	PL915	69.0	73.3	79.5	54.2	69.7	52.3	**66.3**	76.6	72.5	86.0	**78.4**	75.1	78.9	51.9	**68.6**	**71.1**
13	PL917	96.3	73.0	83.0	77.5	68.2	60.8	**76.5**	88.8	95.7	59.4	**81.3**	93.9	78.2	30.3	**67.4**	**75.1**
14	PL920	83.5	57.0	74.7	58.5	51.5	65.0	**65.0**	75.9	83.6	82.9	**80.8**	86.7	74.5	17.1	**59.5**	**68.4**
15	RD3011	88.8	77.6	81.0	75.0	89.8	75.3	**81.2**	68.3	77.7	91.7	**79.2**	92.5	93.1	45.7	**77.1**	**79.2**
16	RD3012	72.5	63.9	62.7	66.4	83.9	66.6	**69.3**	58.5	68.5	94.2	**73.7**	95.8	91.4	38.3	**75.1**	**72.7**
17	RD3013	85.5	82.5	47.0	69.2	76.4	63.9	**70.8**	66.2	48.8	85.4	**66.8**	88.9	79.2	64.9	**77.7**	**71.7**
18	RD3014	92.8	77.5	88.6	84.8	90.9	79.7	**85.7**	85.0	91.3	89.5	**88.6**	94.9	94.1	51.3	**80.1**	**84.8**
19	UPB1087	80.4	57.8	69.3	66.2	73.8	57.1	**67.4**	75.0	66.0	75.8	**72.3**	86.9	76.0	35.0	**65.9**	**68.5**
20	UPB1088	88.7	75.1	86.9	74.2	88.0	61.1	**79.0**	76.9	91.8	93.8	**87.5**	96.2	83.5	29.7	**69.8**	**78.8**
21	BH 946 (C)	92.8	83.5	91.7	84.7	90.9	68.3	**85.3**	90.5	93.5	91.6	**91.8**	97.2	92.2	54.3	**81.2**	**86.1**
22	BH902(C)	92.1	82.5	86.0	82.0	85.8	75.7	**84.0**	80.4	84.8	85.4	**83.5**	94.2	93.3	48.4	**78.7**	**82.1**
23	DWRB137(C)	92.5	81.5	84.2	88.8	88.8	71.0	**84.5**	81.7	88.0	90.0	**86.6**	96.9	97.0	79.3	**91.0**	**87.4**
24	RD2552 (C)	70.4	68.1	74.5	59.2	70.2	50.6	**65.5**	75.3	87.9	80.9	**81.3**	90.9	66.3	16.7	**58.0**	**68.3**
25	RD2899(C)	89.0	83.5	95.4	73.2	88.9	67.8	**82.9**	69.0	95.9	90.1	**85.0**	95.7	91.6	45.3	**77.5**	**81.8**
	Mean	**85.2**	**75.9**	**73.8**	**73.0**	**76.2**	**64.2**		**73.9**	**83.4**	**83.8**		**92.6**	**84.2**	**43.0**		

S= Serial Number; H= Hisar; M= Modipuram; D= Durgapura; K= Karnal; P= Pantnagar; L= Ludhiana; M 1= Mean NWPZ; U= Udaipur; G = Gwalior; V = Vijapur; M 2= Mean CZ; K=Kanpur; V= Varanasi; B = Bhagalpur; M 3 = Mean NEPZ; OM=Overall Mean Across the Zones

Table 4: Thin grain percentage (grains passed through 2.2 mm screen) of genotype in IVT Feed Barley (Irrigated Condition) at different locations

S	Genotype	H	M	D	K	P	L	M 1	U	G	V	M2	K	V	B	M3	OM
1	BH1029	1.7	3.7	10.9	6.0	5.0	3.3	**5.1**	5.5	7.5	1.2	**4.7**	0.8	1.3	21.1	**7.7**	**5.9**
2	BH1030	4.3	5.0	7.9	8.3	7.7	15.9	**8.2**	13.5	5.3	2.3	**7.0**	2.2	6.0	41.9	**16.7**	**10.6**
3	BH1031	1.2	2.3	2.7	4.4	5.8	11.7	**4.7**	6.4	1.5	2.4	**3.4**	0.7	2.7	19.1	**7.5**	**5.2**
4	DWRB215	1.2	3.5	2.0	4.1	6.3	14.2	**5.2**	9.3	1.8	1.9	**4.3**	0.2	0.7	25.3	**8.7**	**6.1**
5	HUB271	1.2	4.6	11.1	13.9	3.1	4.5	**6.4**	6.6	3.1	0.7	**3.5**	0.4	3.2	7.3	**3.6**	**4.5**
6	HUB272	4.4	18.0	17.4	8.7	5.2	18.7	**12.0**	9.0	4.4	2.3	**5.2**	0.5	2.0	33.0	**11.8**	**9.7**
7	KB1816	5.2	16.8	11.4	23.3	5.4	17.1	**13.2**	13.9	2.8	4.2	**7.0**	2.7	6.2	27.7	**12.2**	**10.8**
8	KB1817	3.5	3.4	13.0	6.9	7.9	22.7	**9.6**	7.5	7.6	8.3	**7.8**	0.6	4.1	34.1	**12.9**	**10.1**
9	KB1822	1.5	6.8	3.1	4.5	12.9	13.5	**7.1**	3.9	1.8	1.7	**2.5**	0.1	1.1	25.8	**9.0**	**6.2**
10	NDB1738	3.0	5.2	17.4	5.8	7.9	7.5	**7.8**	5.5	3.6	2.9	**4.0**	1.4	3.1	13.1	**5.8**	**5.9**
11	PL911	3.1	8.0	8.4	15.6	14.4	14.1	**10.6**	14.7	2.7	2.5	**6.6**	1.8	4.4	36.7	**14.3**	**10.5**
12	PL915	4.7	7.0	4.8	16.4	5.7	17.8	**9.4**	3.7	6.7	1.7	**4.0**	3.7	4.4	16.0	**8.0**	**7.1**
13	PL917	0.5	8.0	3.0	5.5	8.6	12.0	**6.2**	2.3	0.9	7.9	**3.7**	1.0	3.6	28.6	**11.1**	**7.0**
14	PL920	2.3	15.7	4.0	14.1	19.2	10.4	**10.9**	5.0	3.5	1.8	**3.4**	1.5	3.8	46.5	**17.3**	**10.6**
15	RD3011	1.7	7.6	4.2	8.5	2.0	6.4	**5.1**	9.7	5.1	1.0	**5.2**	0.9	0.9	23.7	**8.5**	**6.3**
16	RD3012	4.3	15.6	9.8	10.5	5.4	6.6	**8.7**	17.3	9.5	0.4	**9.0**	0.1	1.4	28.7	**10.1**	**9.3**
17	RD3013	1.9	4.9	19.9	9.8	4.8	11.2	**8.7**	9.8	20.7	1.0	**10.5**	1.2	4.5	7.0	**4.2**	**7.8**
18	RD3014	1.0	6.4	2.8	3.6	1.4	5.2	**3.4**	3.5	2.4	1.4	**2.4**	0.4	1.0	19.4	**6.9**	**4.2**
19	UPB1087	2.4	7.4	6.8	9.2	6.0	14.5	**7.7**	8.5	9.9	2.2	**6.9**	1.8	3.4	27.0	**10.7**	**8.4**
20	UPB1088	2.7	7.3	2.8	8.8	2.5	13.3	**6.2**	8.2	1.8	1.0	**3.6**	0.7	3.3	32.4	**12.1**	**7.3**
21	BH 946 (C)	1.0	3.4	1.6	4.3	1.3	9.0	**3.4**	1.4	1.4	0.7	**1.2**	0.6	1.2	16.5	**6.1**	**3.6**
22	BH902(C)	2.0	4.3	4.8	5.7	4.3	6.2	**4.5**	5.9	4.4	2.6	**4.3**	0.8	1.6	21.5	**8.0**	**5.6**
23	DWRB137(C)	1.6	5.3	2.8	2.4	2.9	7.1	**3.7**	3.4	4.0	0.9	**2.8**	0.5	0.5	4.8	**1.9**	**2.8**
24	RD2552 (C)	8.4	9.7	6.0	12.3	8.4	20.4	**10.9**	7.7	3.6	3.3	**4.9**	1.3	7.1	48.6	**19.0**	**11.6**
25	RD2899(C)	2.4	4.0	1.2	9.4	2.6	11.7	**5.2**	9.0	1.0	1.7	**3.9**	1.1	1.4	26.5	**9.7**	**6.3**
	Mean	**2.7**	**7.3**	**7.2**	**8.9**	**6.3**	**11.8**		**7.6**	**4.7**	**2.3**		**1.1**	**2.9**	**25.3**		

S= Serial Number; H= Hisar; M= Modipuram; D= Durgapura; K= Karnal; P= Pantnagar; L= Ludhiana; M 1= Mean NWPZ; U= Udaipur; G = Gwalior; V = Vijapur; M 2= Mean CZ; K=Kanpur; V= Varanasi; B = Bhagalpur; M 3 = Mean NEPZ; OM=Overall Mean Across the Zones

Table 5: Protein content (% dry weight basis)# of genotype in IVT Feed Barley (Irrigated Condition) at different locations

S	Genotype	H	M	D	K	P	L	NWPZ	U	G	V	CZ	K	V	B	NEPZ	OM
1	BH1029	9.0	12.3	11.3	11.6	9.8	9.7	**10.6**	12.5	9.0	11.9	**11.1**	8.4	10.4	13.0	**10.6**	**10.8**
2	BH1030	11.1	10.3	8.9	10.4	9.7	10.2	**10.1**	12.1	8.7	10.8	**10.5**	8.6	11.8	13.3	**11.2**	**10.6**
3	BH1031	9.0	12.1	11.2	12.3	9.9	11.6	**11.0**	12.6	8.8	12.3	**11.2**	8.9	11.4	12.0	**10.8**	**11.0**
4	DWRB215	9.1	12.2	9.7	10.4	10.4	12.6	**10.7**	11.2	10.9	13.1	**11.7**	8.8	12.0	15.4	**12.1**	**11.5**
5	HUB271	9.6	14.4	10.8	11.7	10.4	11.8	**11.5**	11.3	8.6	11.1	**10.3**	9.8	11.7	14.0	**11.8**	**11.2**
6	HUB272	10.4	13.8	11.5	12.5	8.9	12.1	**11.5**	12.0	9.9	11.0	**11.0**	7.6	10.6	13.7	**10.6**	**11.0**
7	KB1816	8.8	12.9	9.7	11.2	8.0	9.9	**10.1**	12.0	8.1	12.7	**10.9**	8.6	9.6	13.5	**10.6**	**10.5**
8	KB1817	9.0	12.3	11.6	11.6	10.2	11.8	**11.1**	12.9	9.4	13.9	**12.1**	8.3	9.8	13.8	**10.6**	**11.3**
9	KB1822	10.7	13.6	10.8	12.2	12.8	13.4	**12.3**	13.4	9.9	12.1	**11.8**	9.8	10.6	13.8	**11.4**	**11.8**
10	NDB1738	9.6	12.2	11.9	10.7	9.6	11.9	**11.0**	10.8	9.7	13.8	**11.4**	9.5	11.7	13.7	**11.6**	**11.4**
11	PL911	10.9	12.9	10.1	11.7	10.1	10.1	**11.0**	13.4	8.1	13.8	**11.8**	8.5	10.9	13.5	**11.0**	**11.2**
12	PL915	8.7	13.1	11.0	12.0	9.7	14.1	**11.4**	11.5	9.8	11.7	**11.0**	9.2	10.1	12.5	**10.6**	**11.0**
13	PL917	10.6	13.6	9.8	12.2	10.9	10.7	**11.3**	11.7	8.6	14.5	**11.6**	9.6	11.3	13.5	**11.5**	**11.5**
14	PL920	10.6	13.3	11.4	12.0	11.6	11.8	**11.8**	13.1	10.6	15.0	**12.9**	9.3	11.9	13.7	**11.6**	**12.1**
15	RD3011	8.0	12.1	9.2	11.5	8.3	10.0	**9.9**	11.6	9.8	11.9	**11.1**	8.1	9.7	13.1	**10.3**	**10.4**
16	RD3012	9.1	14.7	9.4	11.4	8.8	9.8	**10.5**	11.5	10.2	12.6	**11.4**	8.7	11.0	13.5	**11.1**	**11.0**
17	RD3013	9.2	13.8	11.1	12.2	10.9	11.6	**11.5**	13.6	11.5	14.1	**13.1**	10.2	11.0	12.6	**11.3**	**11.9**
18	RD3014	10.2	12.5	10.1	10.4	9.7	10.1	**10.5**	12.9	9.5	13.0	**11.8**	9.1	11.0	13.8	**11.3**	**11.2**
19	UPB1087	12.1	14.1	13.5	11.0	11.2	12.8	**12.5**	15.0	10.9	11.7	**12.5**	11.0	10.8	14.9	**12.2**	**12.4**
20	UPB1088	12.4	12.7	11.1	9.4	8.4	12.4	**11.1**	13.1	9.4	11.1	**11.2**	9.2	12.4	13.1	**11.6**	**11.3**
21	BH 946 (C)	9.4	12.8	10.3	11.7	8.5	12.2	**10.8**	11.8	10.4	13.3	**11.8**	9.5	10.5	12.6	**10.9**	**11.2**
22	BH902(C)	9.1	11.2	10.0	11.7	10.0	10.6	**10.4**	12.9	10.3	12.8	**12.0**	9.2	11.1	12.9	**11.1**	**11.2**
23	DWRB137(C)	10.6	12.3	9.7	9.7	9.2	11.2	**10.5**	10.6	9.9	12.8	**11.1**	8.8	9.7	13.4	**10.6**	**10.7**
24	RD2552 (C)	10.0	12.6	9.3	11.4	9.3	11.8	**10.7**	11.2	8.5	10.3	**10.0**	9.1	10.7	14.2	**11.3**	**10.7**
25	RD2899(C)	8.9	11.2	9.5	12.6	9.5	12.0	**10.6**	12.4	8.7	11.9	**11.0**	8.7	11.1	12.4	**10.7**	**10.8**
	Mean	**9.8**	**12.8**	**10.5**	**11.4**	**9.8**	**11.4**		**12.3**	**9.6**	**12.5**		**9.1**	**10.9**	**13.4**		

S= Serial Number; H= Hisar; M= Modipuram; D= Durgapura; K= Karnal; P= Pantnagar; L= Ludhiana; M 1= Mean NWPZ; U= Udaipur; G = Gwalior; V = Vijapur; M 2= Mean CZ; K=Kanpur; V= Varanasi; B = Bhagalpur; M 3 = Mean NEPZ; OM=Overall Mean Across the Zones
#Predicted through NIR

AVT-IR-TS-FB Zone: NWPZ/CZ

Table 1: Test weight (kg/hl) of entries at different location in AVT Feed Barley (Irrigated conditions)

S. No.	Genotype	Hisar	Modipuram	Durgapura	Karnal	Pantnagar	Ludhiana	Udaipur	Mean
1	KB1707	53.5	50.4	58.2	52.0	59.6	58.7	63.4	**56.5**
2	PL906	56.9	51.4	62.4	53.9	55.5	58.9	64.8	**57.7**
3	RD2994	58.4	55.7	65.1	58.5	56.8	69.6	66.0	**61.5**
4	UPB1080	59.9	57.3	63.6	58.2	59.2	63.1	66.4	**61.1**
5	BH902 (C)	53.9	50.3	61.1	56.0	62.5	56.8	65.6	**58.0**
6	BH946 (C)	53.7	52.0	61.0	54.0	55.4	56.1	64.7	**56.7**
7	DWRB137(C)	58.8	57.2	64.6	52.4	55.3	61.6	63.5	**59.1**
8	RD2552 (C)	52.6	53.2	62.0	54.7	62.5	56.5	64.2	**57.9**
	Mean	**56.0**	**53.4**	**62.2**	**55.0**	**58.3**	**60.2**	**64.8**	

Table 2: Thousand grain weight (g) of entries at different location in AVT Feed Barley (Irrigated conditions)

S. No.	Genotype	Hisar	Modipuram	Durgapura	Karnal	Pantnagar	Ludhiana	Udaipur	Mean
1	KB1707	40.4	34.4	37.2	36.8	46.5	31.5	40.7	**38.2**
2	PL906	46.7	35.6	43.2	37.4	42.7	31.6	38.5	**39.4**
3	RD2994	51.3	36.7	47.4	41.2	38.7	38.4	47.2	**43.0**
4	UPB1080	40.8	33.0	36.9	29.0	42.0	33.0	38.8	**36.2**
5	BH902 (C)	48.4	35.9	42.0	43.5	36.6	34.0	46.4	**41.0**
6	BH946 (C)	46.8	33.0	39.4	37.4	38.8	31.8	45.6	**39.0**
7	DWRB137(C)	49.4	41.6	45.5	37.6	39.8	31.1	39.3	**40.6**
8	RD2552 (C)	40.9	37.1	37.5	36.9	34.3	31.6	40.3	**36.9**
	Mean	**45.6**	**35.9**	**41.1**	**37.5**	**39.9**	**32.9**	**42.1**	

Table 3: Bold grain percentage (grains retained over 2.5 mm screen) of entries at different location in AVT Feed Barley (Irrigated conditions)

S. No.	Genotype	Hisar	Modipuram	Durgapura	Karnal	Pantnagar	Ludhiana	Udaipur	Mean
1	KB1707	57.2	50.1	39.6	65.0	92.2	47.7	84.4	**62.3**
2	PL906	88.4	63.2	69.5	73.0	85.5	55.2	79.0	**73.4**
3	RD2994	92.3	80.9	87.9	86.5	78.4	83.4	88.9	**85.5**
4	UPB1080	73.4	63.0	55.6	55.7	82.5	65.2	75.2	**67.2**
5	BH902 (C)	92.4	75.4	72.1	86.8	67.0	65.6	90.4	**78.5**
6	BH946 (C)	93.9	81.2	81.7	85.0	84.1	62.5	95.6	**83.4**
7	DWRB137(C)	94.7	83.4	85.0	76.6	72.4	56.5	77.2	**78.0**
8	RD2552 (C)	76.9	72.7	69.6	71.8	58.5	53.6	74.2	**68.2**
	Mean	**83.7**	**71.2**	**70.1**	**75.1**	**77.6**	**61.2**	**83.1**	

Table 4: Thin grain percentage (grains passed through 2.2 mm screen) of entries at different location in AVT Feed Barley (Irrigated conditions)

S. No.	Genotype	Hisar	Modipuram	Durgapura	Karnal	Pantnagar	Ludhiana	Udaipur	Mean
1	KB1707	8.8	19.8	19.7	11.7	1.8	16.8	2.6	**11.6**
2	PL906	2.0	11.8	9.9	9.4	2.9	18.5	6.5	**8.7**
3	RD2994	1.2	4.6	2.8	3.4	6.0	4.4	2.2	**3.5**
4	UPB1080	3.7	11.6	8.3	10.4	4.5	6.8	3.0	**6.9**
5	BH902 (C)	1.4	7.3	10.5	3.4	5.7	11.4	2.2	**6.0**
6	BH946 (C)	0.9	4.4	3.5	3.5	3.1	10.7	0.7	**3.8**
7	DWRB137(C)	0.9	4.1	3.9	8.3	7.2	14.9	5.4	**6.4**
8	RD2552 (C)	5.5	7.3	8.7	9.3	14.2	18.1	8.6	**10.2**
	Mean	**3.1**	**8.9**	**8.4**	**7.4**	**5.7**	**12.7**	**3.9**	

Table 5: Protein content (% dry weight basis)# of entries at different location in AVT Feed Barley (Irrigated conditions) #Predicted through NIR

S. No.	Genotype	Hisar	Modipuram	Durgapura	Karnal	Pantnagar	Ludhiana	Udaipur	Mean
1	KB1707	11.3	15.0	15.8	11.2	8.3	12.1	10.2	**12.0**
2	PL906	9.3	13.1	10.0	11.1	9.3	12.7	10.9	**10.9**
3	RD2994	10.4	13.2	9.7	9.9	8.3	10.2	10.7	**10.3**
4	UPB1080	10.1	14.5	10.4	11.8	10.3	11.2	12.0	**11.5**
5	BH902 (C)	8.9	12.8	10.6	10.3	9.6	11.1	10.5	**10.5**
6	BH946 (C)	9.5	13.3	11.3	10.5	8.9	12.0	10.4	**10.8**
7	DWRB137(C)	8.5	12.2	9.3	10.4	9.0	12.7	10.2	**10.3**
8	RD2552 (C)	9.0	12.0	9.9	10.9	8.6	11.6	11.1	**10.4**
	Mean	**9.6**	**13.3**	**10.9**	**10.8**	**9.0**	**11.7**	**10.8**	

IVT/AVT-IR-TS-HLS

Table 1: Test weight (kg/hl) of entries at different locations in IVT/AVT Hulless Barley

S	Genotype	H	M	D	K	P	L	M 1	G	V	U	M 2	K	V	M 3	OM
1	DWRB204	67.2	62.1	77.1	53.8	52.9	70.9	**64.0**	49.0	57.9	78.8	**61.9**	56.8	47.6	**52.2**	**59.4**
2	DWRB216	66.7	50.5	75.0	49.9	52.9	74.1	**61.5**	51.8	64.1	77.2	**64.3**	60.3	47.3	**53.8**	**59.9**
3	DWRB217	66.3	57.4	76.2	56.9	55.2	71.8	**64.0**	55.4	73.7	76.4	**68.5**	60.3	60.1	**60.2**	**64.2**
4	K1149	74.1	68.9	77.9	63.1	64.6	71.7	**70.1**	65.7	78.1	76.7	**73.5**	66.4	66.1	**66.2**	**69.9**
5	KB1843	71.4	67.2	71.5	59.6	73.4	69.7	**68.8**	49.6	72.3	64.8	**62.2**	62.8	46.9	**54.8**	**62.0**
6	KB1848	65.1	58.8	73.5	58.0	58.4	65.2	**63.2**	51.4	67.7	73.7	**64.3**	61.9	46.5	**54.2**	**60.5**
7	UPB1086	62.6	59.9	75.1	53.9	54.9	71.6	**63.0**	45.7	67.0	78.3	**63.6**	53.1	45.5	**49.3**	**58.6**
8	Karan16 (c)	62.9	62.4	65.9	58.0	58.6	65.1	**62.1**	57.2	68.5	72.3	**66.0**	59.8	52.2	**56.0**	**61.4**
9	NDB943(C)	69.4	65.9	77.4	57.3	70.5	76.1	**69.4**	55.3	74.6	74.8	**68.2**	60.3	57.7	**59.0**	**65.6**
10	PL891(c)	72.7	66.5	75.0	55.7	64.1	71.8	**67.6**	52.4	66.4	72.9	**63.9**	56.3	55.0	**55.7**	**62.4**
	Mean	**67.9**	**62.0**	**74.5**	**56.6**	**60.5**	**70.8**		**53.3**	**69.0**	**74.6**		**59.8**	**52.5**		

Table 2: Thousand grain weight (g) of entries at different locations in IVT/AVT Hulless Barley

S	Genotype	H	M	D	K	P	L	M 1	G	V	U	M 2	K	V	M 3	OM
1	DWRB204	37.2	36.2	38.4	34.2	33.7	28.7	**34.7**	35.6	54.6	35.0	**41.7**	36.7	35.7	**36.2**	**37.5**
2	DWRB216	39.7	35.0	38.8	26.6	35.6	35.1	**35.1**	36.1	35.7	36.7	**36.2**	35.3	31.3	**33.3**	**34.9**
3	DWRB217	38.3	51.5	35.7	33.2	34.1	24.7	**36.3**	37.4	55.1	35.8	**42.8**	38.4	32.9	**35.7**	**38.2**
4	K1149	32.7	31.7	33.2	30.8	27.4	22.0	**29.6**	34.9	57.1	33.5	**41.8**	35.0	26.7	**30.9**	**34.1**
5	KB1843	38.1	38.8	35.4	37.4	37.0	27.8	**35.7**	38.9	52.6	38.5	**43.3**	39.3	27.3	**33.3**	**37.5**
6	KB1848	42.2	35.4	38.0	34.0	35.9	31.2	**36.1**	40.4	55.9	40.6	**45.6**	39.5	27.0	**33.2**	**38.3**
7	UPB1086	32.0	33.8	33.0	26.9	43.4	26.1	**32.5**	32.8	31.0	34.5	**32.8**	34.0	25.2	**29.6**	**31.6**
8	Karan16 (c)	36.4	36.0	34.2	32.7	34.4	29.3	**33.8**	33.8	38.5	39.0	**37.1**	36.7	25.9	**31.3**	**34.1**
9	NDB943(C)	38.8	33.3	33.1	31.7	36.9	28.6	**33.7**	35.7	50.9	32.3	**39.6**	34.4	29.9	**32.1**	**35.2**
10	PL891(c)	45.5	43.7	44.3	48.6	45.0	36.6	**44.0**	52.8	57.1	38.9	**49.6**	48.4	38.0	**43.2**	**45.6**
	Mean	**38.1**	**37.5**	**36.4**	**33.6**	**36.3**	**29.0**		**37.8**	**48.8**	**36.5**		**37.8**	**30.0**		

Table 3: Bold grain percentage (grains retained over 2.5 mm screen) of entries at different locations in IVT/AVT Hulless Barley

S	Genotype	H	M	D	K	P	L	M 1	G	V	U	M 2	K	V	M 3	OM
1	DWRB204	56.7	56.7	52.1	55.3	82.2	37.3	**56.7**	73.7	66.6	53.3	**64.5**	60.9	70.8	**65.8**	**62.4**
2	DWRB216	39.1	39.1	44.6	45.1	48.3	41.2	**42.9**	61.0	42.5	42.2	**48.6**	45.0	36.8	**40.9**	**44.1**
3	DWRB217	61.3	61.3	38.8	64.4	65.2	29.0	**53.3**	74.7	62.8	60.3	**65.9**	78.2	42.8	**60.5**	**59.9**
4	K1149	15.1	15.1	26.9	35.5	32.7	19.3	**24.1**	34.7	49.3	29.6	**37.9**	36.1	18.2	**27.1**	**29.7**
5	KB1843	27.3	27.3	27.8	55.7	40.2	22.8	**33.5**	56.2	22.8	75.6	**51.5**	53.0	35.0	**44.0**	**43.0**
6	KB1848	55.0	55.0	48.3	58.7	61.3	41.9	**53.4**	80.1	47.5	18.9	**48.8**	61.6	46.0	**53.8**	**52.0**
7	UPB1086	26.8	26.8	22.9	48.5	52.9	22.2	**33.3**	59.9	24.3	27.8	**37.4**	42.7	28.8	**35.8**	**35.5**
8	Karan16 (c)	49.3	49.3	43.4	48.3	51.7	39.4	**46.9**	52.6	49.9	67.1	**56.5**	63.0	44.9	**54.0**	**52.5**
9	NDB943(C)	43.5	43.5	20.0	50.5	55.9	36.7	**41.7**	67.8	33.7	30.1	**43.9**	63.2	43.8	**53.5**	**46.4**
10	PL891(c)	50.2	50.2	49.7	84.7	75.2	61.1	**61.8**	80.8	27.0	53.0	**53.6**	72.9	32.9	**52.9**	**56.1**
	Mean	42.4	42.4	37.5	54.7	56.5	35.1		64.1	42.6	45.8		57.7	40.0		

Table 4: Thin grain percentage (grains passed through 2.2 mm screen) of entries at different locations in IVT/AVT Hulless Barley

S	Genotype	H	M	D	K	P	L	M 1	G	V	U	M 2	K	V	M 3	OM
1	DWRB204	7.7	7.7	7.3	17.5	3.0	27.9	**11.9**	5.2	9.6	3.3	**6.0**	5.2	5.7	**5.4**	**7.8**
2	DWRB216	15.8	15.8	11.5	18.7	8.3	18.5	**14.8**	7.8	17.7	9.8	**11.8**	13.1	13.7	**13.4**	**13.3**
3	DWRB217	8.5	8.5	16.8	11.3	7.2	31.2	**13.9**	3.9	8.7	4.9	**5.8**	2.6	10.9	**6.7**	**8.8**
4	K1149	30.4	30.4	15.2	22.8	24.1	38.1	**26.8**	14.0	7.4	19.3	**13.6**	14.3	35.2	**24.8**	**21.7**
5	KB1843	24.1	24.1	32.8	11.7	17.5	37.9	**24.7**	14.1	30.5	5.6	**16.7**	10.0	30.7	**20.4**	**20.6**
6	KB1848	11.0	11.0	9.2	12.8	8.2	22.1	**12.4**	4.7	17.1	31.4	**17.7**	4.9	19.5	**12.2**	**14.1**
7	UPB1086	22.8	22.8	19.1	15.1	9.3	35.3	**20.7**	10.8	29.4	7.2	**15.8**	21.8	32.6	**27.2**	**21.2**
8	Karan16 (c)	16.3	16.3	21.7	20.7	16.7	25.3	**19.5**	18.6	19.8	5.2	**14.5**	10.1	20.8	**15.5**	**16.5**
9	NDB943(C)	9.6	9.6	25.8	12.5	5.4	18.1	**13.5**	7.2	25.7	16.2	**16.4**	6.5	16.9	**11.7**	**13.9**
10	PL891(c)	9.1	9.1	8.2	2.1	8.1	11.0	**7.9**	2.2	26.1	10.9	**13.1**	1.9	10.8	**6.3**	**9.1**
	Mean	**15.5**	**15.5**	**16.8**	**14.5**	**10.8**	**26.5**		**8.9**	**19.2**	**11.4**		**9.0**	**19.7**		

H= Hisar; M= Modipuram; D= Durgapura; K= Karnal; P= Pantnagar; L= Ludhiana; M 1= Mean NWPZ; G = Gwalior; V = Vijapur; U= Udaipur M 2= Mean CZ; K=Kanpur; V= Varanasi M 3 = Mean NEPZ; OM=Overall Mean Across the Zones

Table 5: Protein content (% dry weight basis)# of entries at different locations in IVT/AVT Hulless Barley

S	Genotype	H	M	D	K	P	L	M 1	G	V	U	M 2	K	V	M 3	OM
1	DWRB204	10.3	13.3	12.6	10.9	9.1	14.6	**11.8**	9.7	14.1	11.4	**11.7**	9.5	10.2	**9.9**	**11.1**
2	DWRB216	10.6	15.8	11.4	12	11	14.7	**12.6**	8.4	14.8	12.7	**12.0**	9.8	10.4	**10.1**	**11.6**
3	DWRB217	10.9	14.8	14.4	14.4	13.3	15.3	**13.9**	11.3	14.9	10.8	**12.3**	11.8	12.4	**12.1**	**12.8**
4	K1149	11.5	14.4	13.6	10.9	12.8	15.6	**13.1**	10.4	14.6	12.6	**12.5**	11.6	10.1	**10.9**	**12.2**
5	KB1843	10.7	14.2	11.6	13.9	9.1	13.7	**12.2**	9.8	14.5	11.9	**12.1**	9.5	9.9	**9.7**	**11.3**
6	KB1848	11	12.2	13.6	13.5	10.3	15.7	**12.7**	11.4	14.3	14.1	**13.3**	12	11.4	**11.7**	**12.6**
7	UPB1086	12.2	15.1	11.3	13.9	NA	15.6	**13.6**	12.9	13.4	15.1	**13.8**	10.6	11.2	**10.9**	**12.8**
8	Karan16 (c)	10.6	13.8	9.9	11.1	9.5	14.7	**11.6**	9.7	13.5	16.1	**13.1**	9.1	8.7	**8.9**	**11.2**
9	NDB943(C)	12.1	16	11	15.3	12.6	14.9	**13.7**	11.5	15.5	14.9	**14.0**	11.1	10.7	**10.9**	**12.8**
10	PL891(c)	11.3	11.8	14.4	14.4	12.1	15.4	**13.2**	10.4	13.5	13.7	**12.5**	10.4	10.7	**10.6**	**12.1**
	Mean	**11.1**	**14.1**	**12.4**	**13.0**	**11.1**	**15.0**		**10.6**	**14.3**	**13.3**		**10.5**	**10.6**		

S= Serial Number; H= Hisar; M= Modipuram; D= Durgapura; K= Karnal; P= Pantnagar; L= Ludhiana; M 1= Mean NWPZ; G = Gwalior; V = Vijapur; U= Udaipur M 2= Mean CZ; K=Kanpur; V= Varanasi M 3 = Mean NEPZ; OM=Overall Mean Across the Zones #Predicted through NIR

IVT-RF-TS Zone: NEPZ

Table 1: Test weight (kg/hl) and thousand grain weight (g) of entries in IVT-RF-NEPZ at different locations

S.N	Genotype	Test wt (kg/hl)				Thousand Grain Weight (g)			
		Kanpur	Varanasi	Bhagalpur	Mean	Kanpur	Varanasi	Bhagalpur	Mean
1	DWRB213	56.3	52.1	50.5	**52.9**	45.2	38.5	38.8	**40.8**
2	HUB270	59.6	45.7	48.3	**51.2**	41.4	46.2	40.7	**42.8**
3	HUB69	58.4	47.2	47.4	**51.0**	45.6	48.0	41.7	**45.1**
4	KB1815	55.6	36.1	42.0	**44.6**	39.9	36.8	32.6	**36.4**
5	KB1830	62.2	43.8	45.3	**50.4**	42.3	38.8	34.1	**38.4**
6	KB1832	60.7	49.3	48.1	**52.7**	41.2	39.5	34.7	**38.5**
7	NDB1748	64.1	53.0	54.6	**57.3**	47.7	35.9	40.7	**41.4**
8	PL918	61.9	49.7	48.1	**53.2**	44.8	41.2	34.5	**40.1**
9	PL925	63.7	46.9	54.1	**54.9**	44.1	43.7	45.5	**44.4**
10	RD3019	60.8	50.6	45.1	**52.2**	50.7	47.9	30.7	**43.1**
11	RD3020	56.6	45.8	46.1	**49.5**	43.9	44.2	36.5	**41.5**
12	RD3021	61.8	52.5	46.6	**53.7**	41.9	42.1	30.5	**38.2**
13	RD3022	59.5	52.0	48.2	**53.2**	39.8	43.2	40.5	**41.2**
14	K 603 (C)	60.9	50.6	49.9	**53.8**	45.9	47.6	38.8	**44.1**
15	Lakhan (C)	59.2	53.8	48.3	**53.8**	44.4	42.9	40.9	**42.7**
	Mean	**60.1**	**48.6**	**48.2**		**43.9**	**42.4**	**37.4**	

Table 2: Bold and thin grain percentage of entries in IVT-RF-NEPZ at different locations

S.N	Genotype	Bold grain percentage				Thin grain percentage			
		Kanpur	Varanasi	Bhagalpur	Mean	Kanpur	Varanasi	Bhagalpur	Mean
1	DWRB213	96.49	83.99	85.47	**88.7**	0.45	3.47	2.56	**2.2**
2	HUB270	89.79	59.6	78.36	**75.9**	1.72	4.47	2.15	**2.8**
3	HUB69	97.02	72.2	85.16	**84.8**	0.09	8.85	2.83	**3.9**
4	KB1815	74.6	41.16	49.76	**55.2**	5.96	28.2	15.88	**16.7**
5	KB1830	90.32	55.2	56.82	**67.4**	2.22	13.6	14.56	**10.1**
6	KB1832	86.95	61.47	64.76	**71.1**	1.77	8.94	7.63	**6.1**
7	NDB1748	89.93	60.81	72.23	**74.3**	0.41	9.12	5.28	**4.9**
8	PL918	95.02	84.13	84.93	**88.0**	0.97	4.76	2.51	**2.7**
9	PL925	86.22	53.15	90.22	**76.5**	1.52	12.84	1.89	**5.4**
10	RD3019	89.79	81.25	71.19	**80.7**	1.77	5.1	7.58	**4.8**
11	RD3020	91.25	73.88	67.86	**77.7**	1.94	5.84	7.28	**5.0**
12	RD3021	95.82	76.03	61.78	**77.9**	1.29	7.2	12.04	**6.8**
13	RD3022	83.6	74.78	91.08	**83.2**	3.46	5.78	1.87	**3.7**
14	K 603 (C)	89.87	64.96	56.15	**70.3**	1.63	6.98	9.18	**5.9**
15	Lakhan (C)	91.22	67.14	57.11	**71.8**	1.7	6.9	9.87	**6.2**
	Mean	**89.9**	**67.3**	**71.5**		**1.8**	**8.8**	**6.9**	

Bold (retained over 2.5 mm screen) and thin (passed through 2.2 mm screen) grain percentage

Table 3: Protein content (% dry weight basis)# of entries in IVT-RF-NEPZ at different locations

S. N	Genotype	Kanpur	Varanasi	Bhagalpur	Mean
1	DWRB213	7.8	9.9	10.5	**9.4**
2	HUB270	9.9	9.6	11.4	**10.3**
3	HUB69	9.3	11	11.3	**10.5**
4	KB1815	8.2	12.2	12.5	**11.0**
5	KB1830	8.8	11.2	11.1	**10.4**
6	KB1832	8.9	10.4	11.1	**10.1**
7	NDB1748	10.6	8.7	11	**10.1**
8	PL918	8.8	13.1	13.3	**11.7**
9	PL925	10.3	11.6	12.2	**11.4**
10	RD3019	7.8	10.9	11.6	**10.1**
11	RD3020	7.2	12.1	9.9	**9.7**
12	RD3021	8.7	10	10.9	**9.9**
13	RD3022	8.7	11.2	10.3	**10.1**
14	K 603 (C)	8.9	9.7	9.9	**9.5**
15	Lakhan (C)	8.2	10.3	10.4	**9.6**
	Mean	**8.8**	**10.8**	**11.2**	

#Predicted through NIR

AVT/IVT (Salinity-Alkalinity) Zone: NWPZ & NEPZ

Table 1: Test weight (kg/hl) and thousand grain weight (g) of entries in AVT/IVT (SAL/ALK)

SN	Genotype	Test wt (kg/hl)					Thousand Grain Weight (g)				
		Hisar	Rampura	Fatehpur	Kanpur	Mean	Hisar	Rampura	Fatehpur	Kanpur	Mean
1	BH1032	58.6	58.5	58.5	55.6	**57.8**	34.4	47.2	35.3	35.1	**38.0**
2	BH1033	56.9	57.3	50.7	54.4	**54.8**	42.6	46.3	45.4	38.0	**43.1**
3	DWRB214	57.5	57.2	50.4	55.2	**55.1**	46.0	43.7	47.2	38.7	**43.9**
4	HUB273	62.3	56.8	55.5	58.8	**58.4**	46.7	46.5	46.3	41.0	**45.1**
5	HUB274	55.5	58.1	51.5	55.1	**55.0**	43.7	44.9	36.8	35.1	**40.1**
6	KB1815	54.0	55.9	51.4	53.4	**53.7**	45.0	44.5	44.4	38.3	**43.1**
7	KB1822	55.2	58.2	43.0	52.7	**52.3**	44.8	43.7	43.0	35.0	**41.6**
8	KB1845	72.4	57.6	52.3	59.3	**60.4**	42.4	47.1	36.1	40.0	**41.4**
9	NDB1730	56.0	56.5	45.1	51.9	**52.4**	49.1	46.7	36.9	34.4	**41.8**
10	NDB1742	54.4	59.6	49.1	54.9	**54.5**	44.3	50.9	44.2	38.6	**44.5**
11	RD3015	59.3	61.1	56.9	56.7	**58.5**	48.4	51.2	47.3	41.3	**47.1**
12	RD3016	54.2	51.9	49.8	52.1	**52.0**	44.1	43.8	45.4	41.3	**43.7**
13	RD3017	61.5	55.9	51.7	55.3	**56.1**	39.6	46.8	43.9	32.3	**40.7**
14	RD3018	60.4	60.8	53.3	55.7	**57.6**	42.6	44.7	44.7	36.9	**42.2**
15	NDB1173(C)	59.1	54.6	48.3	56.4	**54.6**	43.9	46.5	33.8	42.5	**41.7**
16	RD2552(C)	53.8	55.8	58.6	54.2	**55.6**	37.3	45.7	49.8	37.4	**42.5**
17	RD2794(C)	58.2	57.4	41.6	57.2	**53.6**	42.3	45.9	41.6	36.8	**41.7**
18	RD2907(C)	59.2	60.2	51.8	54.1	**56.3**	36.6	49.8	44.9	37.1	**42.1**
Mean		**58.2**	**57.4**	**51.1**	**55.2**		**43.0**	**46.4**	**42.6**	**37.8**	

Table 2: Bold grain percentage (grains retained over 2.5 mm screen) and thin grain percentage (grains passed through 2.2 mm screen) of entries in AVT/IVT (SAL/ALK)

SN	Genotype	Bold grain percentage					Thin grain percentage				
		Hisar	Rampura	Fatehpur	Kanpur	Mean	Hisar	Rampura	Fatehpur	Kanpur	Mean
1	BH1032	56.3	92.6	89.1	75.4	**78.3**	8.5	1.0	2.4	4.9	**4.2**
2	BH1033	88.4	87.8	94.2	94.0	**91.1**	2.3	2.4	1.0	0.8	**1.6**
3	DWRB214	94.0	86.6	94.1	89.8	**91.1**	0.5	1.8	1.6	17.3	**5.3**
4	HUB273	94.4	91.7	95.6	92.4	**93.5**	1.0	1.2	1.0	1.6	**1.2**
5	HUB274	86.4	84.9	95.1	62.4	**82.2**	2.4	1.6	0.4	7.8	**3.1**
6	KB1815	71.4	82.9	87.5	77.4	**79.8**	4.8	2.5	1.8	2.9	**3.0**
7	KB1822	92.8	85.8	93.5	78.1	**87.6**	0.9	2.1	1.9	4.1	**2.3**
8	KB1845	67.9	89.3	81.7	81.4	**80.1**	6.1	1.1	3.6	3.3	**3.5**
9	NDB1730	92.7	84.8	92.1	67.0	**84.2**	0.7	1.5	2.1	5.1	**2.4**
10	NDB1742	73.8	80.5	88.6	76.3	**79.8**	6.3	2.7	2.2	4.4	**3.9**
11	RD3015	92.7	94.8	95.1	84.7	**91.8**	1.0	1.0	1.7	2.8	**1.6**
12	RD3016	84.9	81.5	95.8	82.7	**86.2**	2.0	3.3	0.7	3.1	**2.3**
13	RD3017	86.4	91.8	91.8	73.7	**85.9**	1.5	1.0	2.0	6.3	**2.7**
14	RD3018	85.8	78.9	93.2	78.5	**84.1**	2.7	2.8	1.1	2.9	**2.4**
15	NDB1173(C)	77.4	90.8	81.3	92.7	**85.5**	4.1	1.0	6.1	0.5	**2.9**
16	RD2552(C)	59.5	89.3	97.9	78.7	**81.3**	13.4	1.3	0.6	4.8	**5.0**
17	RD2794(C)	86.4	91.1	86.7	83.7	**87.0**	3.0	0.7	4.0	2.0	**2.4**
18	RD2907(C)	90.1	93.1	97.4	88.3	**92.3**	2.0	0.3	0.3	2.8	**1.4**
Mean		**82.3**	**87.7**	**91.7**	**80.9**		**3.5**	**1.6**	**1.9**	**4.3**	

Table 3: Protein content (% dry weight basis)# of entries in AVT/IVT (SAL/ALK)

SN	Genotype	Hisar	Rampura	Fatehpur	Kanpur	Mean
1	BH1032	11.0	11.0	9.6	11.0	**10.7**
2	BH1033	12.9	12.0	9.8	9.7	**11.1**
3	DWRB214	9.9	11.8	11.1	9.8	**10.7**
4	HUB273	9.8	11.4	9.6	10.8	**10.4**
5	HUB274	10.8	11.3	10.4	10.6	**10.8**
6	KB1815	11.6	11.9	10.5	11.7	**11.4**
7	KB1822	11.1	13.0	10.5	11.0	**11.4**
8	KB1845	13.1	12.3	10.9	12.7	**12.3**
9	NDB1730	11.9	11.4	11.1	13.0	**11.9**
10	NDB1742	13.2	12.2	9.7	11.0	**11.5**
11	RD3015	8.3	11.1	8.7	10.6	**9.7**
12	RD3016	8.8	11.9	8.8	11.3	**10.2**
13	RD3017	11.7	10.8	11.2	11.0	**11.2**
14	RD3018	10.8	12.5	9.5	9.3	**10.5**
15	NDB1173(C)	11.4	11.8	10.5	10.6	**11.1**
16	RD2552(C)	11.7	11.5	9.1	10.4	**10.7**
17	RD2794(C)	11.2	10.7	10.4	9.3	**10.4**
18	RD2907(C)	12.2	11.4	10.3	10.5	**11.1**
Mean		**11.2**	**11.7**	**10.1**	**10.8**	

#Predicted through NIR

AVT-RF-TS Zone: NHZ

Table 1: Test weight (kg/hl) and thousand grain weight (g) of entries in AVT-RF-NHZ

SN	Genotype	Test weight (kg/hl)					Thousand Grain Weight (g)				
		Almora	Shimla	Majhera	Malan	Mean	Almora	Shimla	Majhera	Malan	Mean
1	BHS478	77.3	65.2	57.4	59.4	**64.8**	58.5	45.5	47.9	48.2	**50.0**
2	BHS479	63.4	70.7	59.1	61.5	**63.7**	52.7	44.4	42.4	42.6	**45.5**
3	BHS480	69.0	62.5	46.2	59.1	**59.2**	53.2	41.3	42.0	44.9	**45.3**
4	BHS481	62.9	68.9	59.0	60.4	**62.8**	60.1	36.1	35.8	36.0	**42.0**
5	BHS482	77.1	63.2	49.7	58.1	**62.0**	52.8	46.4	50.7	47.0	**49.2**
6	HBL864	76.0	63.5	52.1	56.2	**61.9**	48.6	36.0	43.0	37.1	**41.2**
7	HBL865	60.7	70.0	63.8	63.2	**64.4**	63.1	42.8	44.1	46.9	**49.2**
8	HBL866	74.9	72.9	65.4	64.7	**69.4**	56.5	29.5	29.7	36.0	**37.9**
9	HBL867	66.0	68.1	58.1	61.4	**63.4**	50.1	38.4	31.8	35.4	**38.9**
10	HBL868	61.1	61.7	48.4	56.2	**56.9**	55.3	38.9	33.0	38.5	**41.4**
11	UPB1083	61.2	63.1	54.3	59.1	**59.4**	44.8	43.8	36.2	44.0	**42.2**
12	UPB1084	81.6	64.9	55.3	56.9	**64.7**	54.5	34.4	55.4	34.8	**44.8**
13	UPB1085	65.1	67.3	50.0	54.8	**59.3**	61.5	37.4	38.5	38.3	**43.9**
14	VLB165	62.0	68.2	53.6	55.2	**59.8**	53.8	36.0	41.5	38.4	**42.4**
15	VLB166	66.2	65.9	50.1	61.3	**60.9**	50.7	38.9	41.6	42.9	**43.5**
16	VLB167	66.2	70.8	58.0	54.3	**62.3**	57.4	38.1	42.4	40.8	**44.7**
17	VLB168	64.0	65.9	51.5	57.0	**59.6**	58.0	31.0	37.0	31.4	**39.3**
18	VLB169	59.4	71.7	62.5	62.8	**64.1**	54.9	43.4	43.5	44.0	**46.4**
19	BHS352(C)	75.9	76.3	69.9	59.9	**70.5**	47.0	37.6	38.5	41.3	**41.1**
20	BHS400(C)	63.0	63.7	58.1	58.9	**60.9**	51.3	43.9	42.0	44.2	**45.4**
21	HBL113(C)	64.0	72.8	63.9	64.4	**66.3**	59.3	38.8	36.3	40.9	**43.8**
22	VLB118(C)	70.3	61.3	53.9	56.9	**60.6**	62.6	44.4	48.1	45.3	**50.1**
Mean		**67.6**	**67.2**	**56.4**	**59.2**		**54.9**	**39.4**	**41.0**	**40.9**	

Table 2: Bold grain percentage (grains retained over 2.5 mm screen) and thin grain percentage (grains passed through 2.2 mm screen) of entries in AVT-RF-NHZ

SN	Genotype	Bold grain percentage					Thin grain percentage				
		Almora	Shimla	Majhera	Malan	Mean	Almora	Shimla	Majhera	Malan	Mean
1	BHS478	82.5	87.2	90.5	59.4	**79.9**	2.9	2.3	1.9	2.6	**2.4**
2	BHS479	65.6	87.7	85.7	78.7	**79.4**	11.5	2.2	3.3	4.6	**5.4**
3	BHS480	68.2	86.0	84.9	84.7	**80.9**	6.6	2.7	2.6	2.8	**3.7**
4	BHS481	84.6	66.8	72.1	60.4	**71.0**	3.4	7.3	4.7	6.6	**5.5**
5	BHS482	49.3	92.1	96.1	58.1	**73.9**	8.7	1.2	1.5	0.8	**3.0**
6	HBL864	12.1	76.8	76.7	65.0	**57.7**	48.4	8.7	6.5	14.3	**19.5**
7	HBL865	90.9	90.5	83.8	95.2	**90.1**	2.2	2.8	4.4	1.9	**2.8**
8	HBL866	62.4	57.4	59.3	64.7	**60.9**	6.7	28.4	28.2	12.6	**19.0**
9	HBL867	65.1	77.8	65.9	61.4	**67.6**	13.9	5.9	11.5	11.4	**10.7**
10	HBL868	77.8	71.0	63.3	56.2	**67.1**	2.9	5.6	7.6	6.4	**5.6**
11	UPB1083	51.3	80.9	79.0	82.3	**73.4**	28.7	4.6	5.1	4.0	**10.6**
12	UPB1084	37.2	74.8	70.3	56.9	**59.8**	15.7	5.7	9.1	9.5	**10.0**
13	UPB1085	83.1	74.1	81.7	54.8	**73.4**	3.3	3.8	2.1	3.6	**3.2**
14	VLB165	57.2	74.7	75.5	76.4	**70.9**	13.6	3.7	3.1	4.6	**6.2**
15	VLB166	58.6	81.2	80.8	61.3	**70.5**	11.6	3.7	2.8	3.5	**5.4**
16	VLB167	77.4	60.4	61.5	72.9	**68.0**	5.5	5.6	4.5	5.5	**5.3**
17	VLB168	65.8	58.6	56.1	60.8	**60.3**	11.3	18.9	24.7	16.3	**17.8**
18	VLB169	67.3	95.7	94.9	62.8	**80.2**	7.5	0.5	1.1	1.2	**2.6**
19	BHS352(C)	51.9	37.3	29.5	69.9	**47.1**	28.4	31.4	31.5	17.4	**27.2**
20	BHS400(C)	74.3	87.6	83.1	84.6	**82.4**	6.6	2.8	2.8	3.2	**3.8**
21	HBL113(C)	76.8	90.3	75.0	64.4	**76.6**	5.8	2.4	3.5	2.8	**3.6**
22	VLB118(C)	95.0	92.0	95.6	90.2	**93.2**	1.0	1.6	1.0	1.7	**1.3**
Mean		**66.1**	**77.3**	**75.5**	**69.1**		**11.2**	**6.9**	**7.4**	**6.2**	

Table 3: Protein content (% dry weight basis)# of entries in AVT-RF-NHZ

SN	Genotype	Almora	Shimla	Majhera	Malan	Mean
1	BHS478	8.6	6.9	7.9	8.3	**7.9**
2	BHS479	9.8	8.1	8.2	9.7	**9.0**
3	BHS480	8.4	7.1	8.9	7.8	**8.1**
4	BHS481	10.2	6.5	7.1	8.3	**8.0**
5	BHS482	10.8	7.3	10.5	8.5	**9.3**
6	HBL864	10.6	7.9	9.1	8.4	**9.0**
7	HBL865	9.7	7.4	7.7	8.7	**8.4**
8	HBL866	9.4	7.4	8.6	9.0	**8.6**
9	HBL867	8.3	7.5	7.2	8.4	**7.9**
10	HBL868	9.3	7.0	8.3	9.2	**8.5**
11	UPB1083	8.1	7.1	8.6	10.6	**8.6**
12	UPB1084	9.8	6.8	8.7	9.1	**8.6**
13	UPB1085	8.3	7.9	8.6	9.3	**8.5**
14	VLB165	8.8	7.8	8.6	10.1	**8.8**
15	VLB166	7.7	7.2	8.9	9.0	**8.2**
16	VLB167	8.7	8.0	8.9	9.4	**8.8**
17	VLB168	9.4	6.2	7.0	8.9	**7.9**
18	VLB169	8.2	8.2	7.4	9.3	**8.3**
19	BHS352(C)	9.4	8.0	8.8	10.9	**9.3**
20	BHS400(C)	9.2	7.2	7.5	7.9	**8.0**
21	HBL113(C)	8.5	7.4	7.3	8.3	**7.9**
22	VLB118(C)	9.8	7.7	8.8	10.2	**9.1**
Mean		**9.1**	**7.4**	**8.3**	**9.1**	

#Predicted through NIR

BARLEY NETWORK (AICW&BIP)
Monitoring Report of Central Zone (Team 1)

Duration: 13-14 February, 2020 **Locations visited:** Udaipur and Vijapur

Team Members

- Dr. Jogendra Singh, Principal Scientist (Plant Breeding) & Scientist Incharge, Seed and Research Unit, ICAR-IIWBR, Hisar, Haryana
- Dr. Hoshiyar Singh, Prof. & PI, AICW&BIP, RARI, Durgapura, Jaipur (Raj).
- Dr. Abhay Dashora, Asstt. Prof. (GPB), AICW&BIP, MPUAT, Udaipur (Raj).

The team constituted by the Director, IIWBR, Karnal for monitoring of Barley trials in Central Zone, assembled at MPUAT, Udaipur on 13th February, 2020 and visited the Udaipur and Vijapur as per schedule.

(i) BREEDING TRIALS:

A. Location wise observations:

Udaipur

Three barley coordinated trials (AVT-IR-FB, IVT/AVT-IRFB-HL and IVT-IR-FB) were monitored on 13th February, 2020 at the Centre. All the experiments were conducted as per the technical programme and were found in good conditions.

Vijapur

Two barley breeding trials *viz*; IVT/AVT-IRFB-HL and IVT-IR-FB were monitored at Vijapur on 13h February, 2020.The trials were conducted as per technical programme and found in good condition.

B. Disease / pest incidence:

There was no incidence of rusts and leaf spot observed in any trial during the crop season at Udaipur and Vijapur. Minor incidence of loose smut was observed in few entries while few entries showed moderate incidence of aphid at both locations.

C. Trials rejected: Nil

D: Entries observed as segregating/mixtures:

The following entries were noticed to have significant amount of segregation/mixture in various trials. However, few entries were showing off type plants.

Trial Name	Entries with	
	Segregation/ mixtures	Off types/Need Purification
AVT-IR-FB	-	-
IVT/AVT-IRFB-HL	IVT/AVT-IRFB-HL-E1 IVT/AVT-IRFB-HL-E4 IVT/AVT-IRFB-HL-E5 IVT/AVT-IRFB-HL-E8	IVT/AVT-IRFB-HL-E3 IVT/AVT-IRFB-HL-E6, IVT/AVT-IRFB-HL-E10
IVT-IR-FB	IVT-IR-FB-E22	IVT-IR-FB-E5, IVT-IR-FB-E14 IVT-IR-FB-E24

Note: In IVT/AVT-IRFB-HL trial, entry IVT/AVT-IRFB-HL-E8 showed poor germination besides having segregation/mixture.

(ii) AGRONOMY TRIAL:

At Udaipur centre following Agronomy trials were monitored.

1. Effect of irrigation on productivity of barley (SPL-2).
2. Effect of Zn application on quality and productivity of barley (SPL-5).

Both the trials were planted as per the technical programme and were found in good conditions.

(iii) ENTOMOLOGY TRIAL:

At Vijapur centre, one entomology trial entitled "*Management of barley aphids through foliar applications of new biochemical molecules*" was conducted as per technical programme. Different treatment effects were clearly observed.

(Jogendra Singh) Principal Scientist & Incharge ICAR-IIWBR, Seed & Research Farm, Hisar (Haryana)	**(Hoshiyar Singh)** Prof. & PI, AICW&BIP, RARI, Durgapura, Jaipur (Rajasthan)	**(Abhay Dashora)** Asstt. Prof. (GPB) AICW&BIP, MPUAT, Udaipur (Rajasthan)

Barley Improvement (AICRP wheat and barley)
Monitoring Report of barley trials in NWPZ & CZ (2019-20)

Duration of Monitoring: 03-05, 2020 **Locations Visited:** Mathura, Agra, Morena, Gwalior, Jhansi and Tikamgarh

Team Members:

Dr AS Kharub, Principal Scientist, ICAR-IIWBR, Karnal
Dr. Dinesh Kumar, Principal Scientist, ICAR-IIWBR, Karnal
Dr SR Pancholi, Plant Breeder, RARI, Durgapura
Dr PS, Shekhawat, Plant Pathologist, RARI, Durgapura

The above barley monitoring team visited different locations of the North Western Plain zone (NWPZ) and Central Zone (CZ) during March 03-05, 2020. The team monitored different coordinated yield, disease and agronomy experiments and the observations recorded are briefed hereunder location wise-

Mathura: AVT-MB-TS-NWPZ and IVT-MB-TS-NWPZ trials were monitored at Mathura. The trials were conducted as per recommended layout. The trials were rejected due to the stray animal grazing. The trial should be given to the Mathura centre only after some arrangements are made to keep away stray animals. The matter was discussed with Dr TS Teotia, Divisional Director Agriculture, Mathura and he assured that boundary wall will be constructed before the next season.

Agra: The agronomy experiments were observed at Agra. All the allotted experiments were conducted at this location with proper layout and the crop was very good. At Agra centre, it was suggested to conduct nitrogen level trials in optimum fertility blocks to get better treatment expressions. In hydrogel experiment, the treatment effects were visually observed and the hydrogel has the effect on shortening the height of the plants. There was lodging in most of the entries under N3 treatments of AVT-MB-TS trial.

Morena: IVT-IR-FB-CZ and IVT/AVT-Hulless trials were monitored at Morena The trials were conducted as per recommended layout and crop performance was good. In IVT-IR-FB-CZ, the entries IVT-IR-FB-04, 06, 09, 11, 24 were observed with off type plants and needs purification. The entries IVT-IR-FB- 2 and 22 were observed as mixture/segregation. The covered and loose smut in traces was observed in the entries IVT-IR-FB-8, 13, and 23. The six rowed entries namely IVT-IR-FB- 9,13, 15, 20, 22, 23, 25, 12 & 17 were found lodged (>50%). The IVT/AVT-Hulless-CZ The trial was conducted as per recommended layout. The entry IVT/AVT-Hulless-01&10 was observed with off type plants and needs purification. The entries IVT/AVT-Hulless-05 and 8 were observed as mixture/segregation.

Gwalior: IVT-IR-FB-CZ and IVT/AVT-Hulless were monitored. The trials were conducted as per recommended layout and crop performance was good. In IVT-IR-FB-CZ, the entries IVT-IR-FB-04, 06, 09, 11, 24 were observed with off type plants and needs purification. The entries IVT-IR-FB- 2 and 22 were observed as mixture/segregation. The covered and loose smut in traces was observed in the entries IVT-IR-FB-8, 13, and 23. The IVT/AVT-Hulless-CZ trial was conducted as per recommended layout. The entry IVT/AVT-Hulless-01&10 was observed with off type plants and needs purification. The entries IVT/AVT-Hulless-05 and 8 were observed as mixture/segregation. The crop was good.

Jhansi: The IVT/AVT-Hulless-CZ trial was conducted at Jhansi as per recommended layout. The entry IVT/AVT-Hulless-01&10 was observed with off type plants and needs purification. The entries IVT/AVT-Hulless-05 and 8 were observed as mixture/segregation. The crop was good.

Tikamgarh: The IVT/AVT-Hulless-CZ trial was conducted at Jhansi as per recommended layout. The entry IVT/AVT-Hulless-01&10 was observed with off type plants and needs purification. The entries IVT/AVT-Hulless-05 and 8 were observed as mixture/segregation. The crop was good. Very poor plant stand (<20%) was observed in the entry IVT/AVT-Hulless-06 at Tikamgarh.

Agronomic Trials: Four agronomy experiments were observed at Agra. All the allotted experiments were conducted at this location with proper layout and the crop was very good. At Agra centre, it was suggested to conduct nitrogen level trials in optimum fertility blocks to get better treatment expressions. In hydrogel

experiment, the treatment effects were visually observed and the hydrogel has the effect on shortening the height of the plants. There was lodging in most of the entries under N3 treatments of AVT-MB-TS trial.

Table: The entries observed with segregation/mixtures and needs purification

Trial	Needs purification	Segregation /mixture	Trial performance
AVT-MB-TS and IVT-MB-TS	-	-	Trial rejected due to grazing at Mathura center
IVT-IR-FB	IVT-IR-FB-04, 06, 09, 11, 24	IVT-IR-FB- 2 and 22	
IVT/AVT-Hulless	IVT/AVT-Hulless-01,10	IVT/AVT-Hulless-05 and 8	

Sd/-	Sd/-	Sd/-	Sd/-
(SR Pancholi)	(PS Shekhawat)	(Dinesh Kumar)	(AS Kharub)
ICAR-IIWBR, Karnal	RARI, Durgapura	ICAR-IIWBR, Karnal	ICAR-IIWBR, Karnal

Monitoring Report of Barley Improvement (AICW&BIP) for NWPZ

Duration: 3th – 7th March 2020
Locations visited: Bawal, Durgapura,Tabiji, Fatehpur, HAU(Hisar), IIWBR (Hisar), Bathinda and Ludhiana
Team Members :
Dr. Lokendra Kumar, Pr. Scientist, IIWBR, Karnal
Dr Anil Khippal, Pr. Scientist, IIWBR, Karnal
Dr. O.P. Gangwar, Scientist, IIWBR-Shimla
Dr. Simarjit Kaur, Breeder (Barley), PAU, Ludhiana

The team constituted by the Director, IIWBR, Karnal for monitoring of Barley Trials & Nurseries in NWPZ, assembled at IIWBR, Karnal on 3th March, 2020 and visited the different locations.

A: <u>Location wise observations</u>

Bawal
The team visited IVT and AVT malt trials conducted at Bawal on 3th March, 2020. Technically, the trials were in good shape but due to heavy wind and rains, few entries were lodged. The team noticed the mixtures/segregation in one entry of IVT malt trial.

Durgapura
On 4th March, the team visited the barley trials at RARI, Durgapura. There were five breeding trials, four agronomy trials, two nurseries and one ICARDA trial at the centre. Some of the entries in breeding trials were lodged but technically all trials were in good shape. Covered smut and stripe rust diseases were observed in few entries. The team noticed the mixtures/segregation in some entries of breeding trials.

Tabiji
The team visited IVT and AVT Feed trials at Tabiji on 4th March, 2020. The performance of both trials was excellent. The team noticed the mixtures/segregation in some entries of feed trials.

Fatehpur
The team visited Salinity trial at Fatehpur on 5th March, 2020.Trial was very good in execution and expression. Covered smut was noticed in some of entries.

HAU (Hisar),
On 6th March, the team visited the barley trials at HAU, Hisar. There were six breeding trials, four agronomy trials, two nurseries and two ICARDA trials at the centre. All the trials and nurseries were in good condition. Covered smut, loose smut and stripe rust diseases were observed in few entries. The team noticed the mixtures/segregation in some entries of breeding trials.

Hisar (IIWBR)
The team visited the centre on 6th March, 2020. There was single Salinity trial at the centre. The trial was good from conduction point of view.

Bathinda
The team visited the centre on 6th March, 2020. There was IVT and AVT trials of malt barley. Both trials were good in execution and performance. Covered smut and loose smut was reported in some entries of these trials. The team noticed the mixtures/segregation in some entries of malt trials.

Ludhiana
The team visited at the centre on 7th March, 2020. There were five breeding trials, three agronomy trials, three nurseries and two ICARDA trials-cum-nurseries conducted at the centre. All the trials and nurseries were in good condition by execution and expression. Covered smut and loose smut diseases were observed in few entries. The team noticed the mixtures/segregation in some entries of breeding trials.

B: Disease / pest incidence.
Yellow rust was observed at Durgapura in IVT/AVT-(Hulless) trial. In this trial, the entry no. 9 and 5, the yellow rust score was 80S while for entry no. 8, the score was 40S. In entry no. 3 of this trial, the score of covered smut was in the range of 10-25%.

C: Trials rejected: Nil

D: Entries observed as segregating/off types/mixtures:

The following entries were noticed to have segregation/ off types/mixture in various trials:

Trial Name	Entries with	
	Segregation / mixtures and so rejected	**Off types/ mixtures and needs purification**
IVT (FB) NWPZ-IR-TS	IVTIRFB-2 (waxy and non waxy spike), IVTIRFB-13 (variation for height and ear), IVTIRFB-22 (segregation for height and ear)	IVTIRFB-1,6,10,11,24
AVT (FB) NWPZ-IR-TS	Nil	Nil
IVT/AVT-(Hulless)	IVT/AVT-(Hulless)-8 (mixture of all types 2R, 6R and height	IVT/AVT-(Hulless)-5,10
IVT (MB) NWPZ-IR-TS	IVTIRMB-13 (segregation rudimentary spikelets)	IVTIRMB-6,11,14,19
AVT (MB) TS NWPZ	Nil	Nil
AVT-SAL:/ALK	Nil	AVTSST-5,15

E. Disease / pest screening
Disease pressure was satisfactory in disease screening nurseries.

F: Agronomic Trials
All trials were well conducted.

G: Barley Quality Screening Nursery
The nursery was well conducted at Durgapura and Ludhiana

(Dr. Lokendra Kumar, Pr. Scientist, (Barley), IIWBR, Karnal)	(Dr Anil Khippal, Pr. Scientist, IIWBR, Karnal)	(Dr. O.P. Gangwar, Scientist, IIWBR-Shimla)	(Dr. Simarjit Kaur, Breeder PAU, Ludhiana)

Proforma for Zonal Monitoring Report
Virtual Zonal meeting of NHZ was organised through Whatsapp video calls
Zone: NHZ

Name of team members:

Name	Centre
Dr R.P.Meena, Dr. Mumratha, Dr. Ravindra Kumar	ICAR-IIWBR, Karnal
Dr Lakshmi Kant, Dr K K Mishra, Dr. Dibakar Mahanta	ICAR-VPKAS, Almora
Dr. Dharam Pal, Dr. Madhu Patial	ICAR-IARI Regional Station, Shimla
Dr Naval Kishore	CSK HPKV, HAREC Bajaura
Dr Vijay Rana, Dr. A.D. Bindra, Dr. Ajai Srivastava	CSK HPKV, RWRC, Malan
Dr. M.K. Pandey	SKUAST, Jammu
Dr. Ajay Kumar	College of forestry, VCSG Uttarakhand University of Horticulture & Forestry, Bharsar, Ranichauri, Tehri Garhwal
Dr. Anjali Agrawal	GBPUAT Regional Station, Majhera

Centres monitored:

Centre	Date
Ranichauri	24.04.20
Majhera	24.04.20
Hawalbagh	24.04.20
Shimla	24.04.20
Bajaura	24.04.20
Malan	24.04.20

Breeding trials allocated & monitored:

Centre		Trial	Remark
Ranichauri	Barley	IVT-TS-RF	Good
Howalbagh	Barley	IVT-TS-RF	Very Good
Shimla	Barley	IVT TS RF	Very Good
Malan	Barley	IVT TS RF	Very Good
Bajaura	Barley	IVT TS RF	Very Good

*** Partially lodging.**

Trials not conducted/rejected by monitoring team:

Centre	Trial	Remark
NIL		

Entries recommended for purification

Trial	Entry	Remarks
Wheat	Nil	
Barley		
IVT-TS-RF-	NHGBZ 1902	Few 2 row off type plants
	NHGBZ 1911	Few waxy/non-waxy type plants

Entries recommended to be dropped from further testing:

Trial	Entry	Remarks
	NIL	

Report on Agronomical Trials:

Wheat

Trial	Centre	Remark
SPL-1 Maximizing the wheat…….fertilizer rates & 4 Optimization of nitrogen …..different zones in wheat	**Hawalbagh**	Conducted properly, treatment effects were visible
SPL-1, SPL-4 in wheat, SPL 1 and 4 in barley	**Malan**	Conducted properly, treatment effects were visible

Report on Pathological Nurseries: Nil

Special comments, if any

1. The crop is in grain filling stage, data may be expected by the end of June.
2. This year disease pressure, especially yellow rust is quite high at Malan and Bajaura centres.
3. Since the rust incidence at Bajaura Center are very high Dr Naval Kishore is requested to send the samples to Flowerdale for analysis.

Signature of the monitoring team

Dr Dharam Pal ICAR-IARI, Shimla	Dr. Dr. Mumratha ICAR-IIWBR Karnal	Dr M.K. Pandey SKUAST, Jammu	Dr R.P. Meena ICAR-IIWBR Karnal
Dr Vijay Rana RAWRS Malan	Dr Ravindra Kumar IIWBR Karnal	Dr A D Bindra RAWRS Malan	Dr Lakshmi Kant ICAR-VPKAS Almora

Zonal Monitoring Report NEPZ (Barley Trials) 2019-20
Team 1 Report

Period of visit: **23.02.2020 to 26.02.2020**

Name of team members:

Dr. P K Gupta, Barley Breeder, CSAUA&T, Kanpur
Dr. RK Singh, Agronomist, BHU, Varanasi
Dr. S. P. Singh, Plant Pathologist, NDUA&T, Faizabad
Dr. Chuni Lal, Barley Breedeer, ICAR-IIWBR, Karnal

Centres visited:

Dilipnagar, Farm, CSAUA&T, Kanpur
Kanpur, CSAUA&T, Kanpur
Kumaraganj, NDUA&T, Faizabad
Masodha, Crop Rese. Stn., NDUA&T, Faizabad
Varanasi, BHU, Varanasi
Saini, Regional Research Centre, CSAUA&T, Kanpur

Breeding trials allocated & monitored:

Centre	Trial	Remark*
Dilipnagar	SAT-IR	Very Good
Kanpur	IVT-IR-FB; IVT-RF-FB; IVT/AVT-IR-FB (HL)	Very Good
Kumarganj	SAT-IR** ; IVT-IR-FB**; IVT-RF-FB; IVT/AVT-IR-FB (HL)	Good
Varanasi	IVT-IR-FB; IVT-RF-FB; IVT/AVT-IR-FB (HL)	Very Good
Saini	IVT-RF-FB	Very Good

*****Evaluated trials as very good, good and average based on conduction; **trials were submerged due to irrigation coupled with rain.

Trials not conducted / rejected by monitoring team: Nil

Entries showing promising performance in breeding trials:

Trial	Entry	Remarks
IVT-IR-FB	IVT-IRFB-E3, IVT-IRFB-E8, IVT-IRFB-E10	Visually were superior
IVT-RF-FB	IVT-RFFB-E6, IVT-RFFB-E2, IVT-RFFB-E10	Visually were superior
IVT/AVT-IRFB (HL)	IVT/AVT-IRFB-HL-E6, IVT/AVT-IRFB-HL-E2, IVT/AVT-IRFB-HL-E3	Visually were superior
SAT-IR-FB	3, 6,7	Visually were superior

Entries recommended for purification:

Trial	Entry	Remarks
IVT-RF-FB	IVT-RFFB-E10	Few off types for 2-row types
IVT/AVT-IR-FB (HL)	IVT/AVT-IRFB-HL-E1	Few off types for 2-row types

Entries recommended to be dropped from further testing:

Trial	Entry	Remarks
IVT/AVT-IRFB-HL	IVT/AVT-IRFB-HL-E5, IVT/AVT-IRFB-HL-E8	Mixture of pigmented and non-pigmented (E5) and very high mixture of 2-row and 6-row types (E8)

Report on National and International Nurseries

Centre	Nursery	Remarks
Kanpur	7th GSBON, 7th GSBYT, EIBGN, NBGSN	In NBGSN and EIBGN infestation of aphids was high

Faizabad	7th GSBON, EIBGN and NBGSN	In NBGSN there was no germination in the line RD3009. In 7th GSBON irrigation was given
Varanasi	NBGSN and EIBGN	Lines namely, BH1025 (12), RB3008 (12), DWRB182 (13), BBM816 (12) were observed with resistant reaction to leaf blight.

Report on Barley Quality Components Nurseries

Centre	Nursery	Remarks
Kanpur	BQCN for beta-glucon, BQSN for Malt and BQSN for Huless Barley	In all the three BQSN, infestation of aphids was very high

Entries exhibiting higher diseases incidence / insect infestation:

Trial	Entry	Remarks
IVT-IR-FB	IVT-IRFB-E21 (68); IVT-IRFB-E2 (46), IVT-IRFB-E24 (46), IVT-IRFB-E17 (36)	A score of 36 to 68 was observed in these entries for leaf blight
IVT-RF-FB	IVT-RFFB-E15 (68), IVT-IRFB-E11 (57)	A score of 57 to 68 was observed in these entries for leaf blight
IVT/AVT-IRFB-HL	IVT/AVT-IRFB-HL-E7 (78), IVT/AVT-IRFB-HL-E5 (58), IVT/AVT-IRFB-HL-E9 (57), IVT/AVT-IRFB-HL-E1 (47),	A score of 47 to 78 was observed in these entries for leaf blight

Report on Agronomical Trials:

Centre	Trial	Remark
Kanpur	SPL2; SPL5	No visible differences were observed for irrigations and Zn applications compared to the control in the respective trials
Masodha	SPL2; SPL5	In SPL2 visible differences among irrigated and non-irrigated plots were visible, but between the irrigated treatments there were no differences. In SPL5 the treatment T3 and T2 had visible superiority over the control.
Varanasi	SPL2; SPL5	In SPL2 visible differences among treatments were observed. Plots with 3 irrigations were superior followed by 2-irrigations over the control. In SPL5 non visible differences were observed among the treatments.

*****conductance of agronomical trials at all the locations was excellent except these were sown very late at Masodha (20.12.2020)

Report on Pathological Nurseries and trials:

Centre	Remark
Kanpur	All the three (NBDSN, EBDSN and IBDSN) barley plant pathological nurseries were conducted satisfactorily. Infection of leaf blight had just started; the levels were not good enough for scoring.
Faizabad	All the three (NBDSN, EBDSN and IBDSN) barley plant pathological nurseries were conducted masterly. The infector rows had developed sufficient leaf blight disease which was progressing into the candidate entries. However, infection had just started at lower leaves, and was not good enough for scoring.

	One trial on "Chemical Control of Leaf Blight" was conducted with 9-treatments. As the infection of leaf blight had just started, the treatment differences could not be observed.
Varanasi	All the three (NBDSN, EBDSN and IBDSN) barley plant pathological nurseries were conducted excellently. The disease pressure of leaf blight was very high. Few lines exhibited moderate to resistant reaction eg. In IBDSN line nos. 203 (14), 204(14), 317 (12), 217 (25), 135 (24) and in NBDSN 56 (35) were observed to be promising.

Report on Entomological Nurseries and trials:

Centre	Remark
Kanpur	One nursery (NBDSN) was sown for screening against aphids. Aphid pressure was high and lines like 1, 33, 119, and 120 were observed to be almost free of aphids. One trial on "Management of foliar aphids through bio-pesticides and chemicals" with 8-treatments including control was also conducted. The treatment differences were not discernible as the control itself was almost free from the infestation by aphids

Special comments, if any –

Signature of the monitoring team members

-sd-	**Not reported**	**-sd-**	**-sd-**
(Dr PK Gupta)	**(Dr RK Singh)**	**(Dr SP Singh)**	**(Dr Chuni Lal)**

Barley Network (AICW&BIP)
Monitoring Report of North Eastern Plain Zone
Team 2 Report

Duration: 27th February to 2nd March, 2020
Locations visited: Kalyani, Sabour, Pusa (CAU), Ranchi and Chiyanki
Team Members

- Dr. Jogendra Singh, Principal Scientist (Plant Breeding) & Scientist Incharge, Seed and Research Farm, ICAR-IIWBR, Hisar (Haryana)
- Dr. Nitish De, Sr. Scientist cum Assoc. Prof. BAU, Sabour (Bihar)
- Dr. Ravindra Kumar, Scientist, ICAR-IIWBR, Karnal (Haryana)

The team constituted by the Director, IIWBR, Karnal for monitoring of Barley trials in North Eastern Plain Zone, assembled at BCKV, Kalyani on 27th February, 2020 and visited the different locations as per schedule.

(iv) BREEDING TRIALS:

A. Location wise observations:

Kalyani: One allotted barley breeding trial (IVT-IR-Feed Barley) was conducted in proper way at the Centre. The experiment was found in good condition. However, high incidence of leaf blight was observed in few entries. Minor incidence of loose smut was also observed in few entries.
Sabour: Two barley breeding trials were conducted at Sabour centre. Both the trials were conducted according to technical programme and found in good condition. No rust was seen in the trials while leaf blight and loose smut were observed in few barley entries. Mostly entries showed lodging in the trials.
Pusa (CAU): Two breeding trials namely, IVT-IR-Feed Barley and IVT-RF-NEPZ were conducted at Pusa Centre. Mostly entries were lodged in both trials. No rust was observed in breeding trials. However, minor incidence of leaf blight and loose smut were observed in few entries.
Ranchi: At Ranchi centre, two barley breeding trials were conducted as per technical programme and found in good conditions. No rusts were seen in the trials while leaf blight and loose smut were observed in few barley entries. However, few entries were lodged in IVT-IR-Feed Barley.
Chianki: One breeding trial namely, IVT-RF-NEPZ was conducted at the Centre, which was as per technical programme and found in good condition. Minor incidence of leaf blight was observed in the trial.

B. Disease / pest incidence:

There was no incidence of the rusts in any trial. The incidence of leaf blight was ranged from 12 (IVT-IR-FB-7) to 99 (IVT-IR-FB-17), although it was recorded maximum at Kalyani Centre. Minor incidences of loose and covered smuts were observed in few entries.

C. Trials rejected: Nil

D: Entries observed as segregating/mixtures:

The following entries were noticed to have significant amount of segregation/mixture in various trials. However, few entries were showing off type plants.

Trial Name	Entries with	
	Segregation/ mixtures	**Off types**
IVT-RF-NEPZ	IVT-RF-1	IVT-RF-13
IVT-IR-FB	IVT-IRFB-1, IVT-IRFB-2, IVT-IR-FB-22	IVT-IRFB-4, IVT-IRFB-6, IVT-IRFB-10, IVT-IRFB-11, IVT-IRFB-21, IVT-IRFB-23, IVT-IRFB-24

(Nithish De)
Sr. Scientist cum Assoc. Prof.
BAU, Sabour (Bihar)

(Ravindra Kumar)
Scientist, ICAR-IIWBR, Karnal (Haryana)

(Jogendra Singh)
Principal Scientist
ICAR-IIWBR, Seed and Research Farm, Hisar

Barley Frontline Demonstrations (BFLDs)

During the *rabi* crop season 2019-20, 250 Barley Frontline Demonstrations (BFLDs) of one acre each were allotted to 21 cooperating centers all over India in six states namely, HP, UP, Punjab, Haryana, Rajasthan and MP. Out of these, 231 were conducted by 20 centers, covering 237 acres area of 251 farmers. Improved barley varieties with complete package of practices (irrigation management, nutrient management, weed control, seed treatment etc.) were demonstrated.

Centre wise distribution of barley FLDs during *rabi* 2019-20 (in acres)

SN	Zone and Centre	BFLDs Allotted	BFLDs Conducted	Area sown (acres)	No. of farmers/ locations
Northern Hills Zone (NHZ)					
1.	CSKHPKV, HAREC, Bajaura, Kullu (HP)	12	5	5	7
2.	ICAR-IARI, RS, Amartara Cottage, Shimla (HP)	12	12	12	17
North Eastern Plains Zone (NEPZ)					
3.	NDUA&T, Kumarganj, Ayodhya (UP)	12	12	12	12
4.	KVK (IAS-BHU), Barkachha, Mirzapur (UP)	12	12	12	12
5.	CSAUA&T, Kanpur (UP)	12	12	12	12
6.	BHU, Varanasi (UP)	12	Not conducted	-	-
North Western Plains Zone (NWPZ)					
7.	PAU, Ludhiana (Punjab)	8	8	8	8
8.	KVK (PAU), Khokhar Khurd, Mansa (Punjab)	12	12	12	14
9.	CCSHAU, Hisar (Haryana)	12	12	12	12
10.	KVK (BB Ashram), Rampura, Rewari (Haryana)	12	12	12	12
11.	KVK (CCSHAU), Bhiwani (Haryana)	12	12	12	16
12.	RARI (SKNAU), Durgapura, Jaipur (Rajasthan)	16	16	16	16
13.	KVK (Pragati Trust), Tankarda, Chomu, Jaipur (Rajasthan)	10	10	12*	8
14.	KVK (AU-Kota), Akorashi, Dhindora, Hindauncity, Karauli (Rajasthan)	12	12	12	16
Central Zone (CZ)					
15.	RCOA (MPUA&T), Udaipur (Rajasthan)	12	12	12	12
16.	KVK (MPUA&T), Dhoinda, Rajasmand (Rajasthan)	12	12	12	12
17.	KVK (JNKVV), Kuthulia Farm, Rewa (MP)	12	12	12	15
18.	KVK (JNKVV), Purushottampur, Panna (MP)	12	12	16*	14
19.	KVK (JNKVV), Tikamgarh (MP)	12	12	12	12
20.	KVK (RVSKVV), Biaora, Kothi Bagh, Rajgarh (MP)	12	12	12	12
21.	COA (JNKVV), Ganj Basoda, Vidisha (MP)	12	12	12	12
	Total	**250**	**231**	**237**	**251**

** Area covered more than allotted which is restricted equal to allotted FLDs.*

State wise distribution of barley FLDs during *rabi* 2019-20 (in acres)

S.N.	State	BFLDs Allotted	BFLDs Conducted	Area Sown (acres)	No. of farmers
1.	HP	24	17	17	24
2.	UP	48	36	36	36
3.	Punjab	20	20	20	22
4.	Haryana	36	36	36	40
5.	Rajasthan	62	62	64*	64
6.	MP	60	60	64*	65
Total		**250**	**231**	**237**	**251**

** Area covered more than allotted which is restricted to area equal to allotted FLDs.*

Zone wise distribution of barley FLDs during *rabi* 2019-20 (in acres)

SN.	Zone	BFLDs Allotted	BFLDs Conducted	Area Sown (acres)	No. of Farmers/ Locations
1.	NHZ	24	17	17	24
2.	NEPZ	48	36	36	36
3.	NWPZ	94	94	96*	102
4.	CZ	84	84	88*	89
Total		**250**	**231**	**237**	**251**

** Area covered more than allotted which is restricted to area equal to allotted FLDs.*

State wise yield gain during *rabi* 2019-20

State	BFLDs yield (q/ha)	Check yield (q/ha)	Gain (%)
HP	25.93	21.03	23.31*
UP	42.43	32.38	31.05***
Punjab	44.13	39.72	11.10***
Haryana	47.96	45.26	05.95**
Rajasthan	55.01	49.15	11.92***
MP	36.09	29.27	23.31***

**** Significant at 1 percent level, ** Significant at 5 percent level, NS– Non-significant*

The highest gain in barley yield was recorded in UP (31.05 %) followed by HP and MP (23.31). The lowest gain in yield was reported in Haryana (5.95 %).

Zone wise productivity over regional during *rabi* 2019-20

Zone	BFLDs yield (q/ha)	Regional mean yield (q/ha)	Gain (%)
NHZ	25.93	20.75	24.94**
NEPZ	42.43	31.11	36.39***
NWPZ	52.82	46.38	13.88***
CZ	37.87	31.30	21.01***

**** -Significant at 1 per cent level*

The yield gain due to improved varieties over regional mean yield was highest in NEPZ (36.39%) followed by NHZ (24.94 %), CZ (21.01%) and NWPZ (13.88 %).

Zone wise productivity over check during *rabi* 2019-20

Zone	BFLDs yield (q/ha)	Check mean yield (q/ha)	Gain (%)
NHZ	25.93	21.03	23.31*
NEPZ	42.43	32.38	31.05***
NWPZ	52.82	48.21	09.57***
CZ	37.87	31.68	19.55***

****- Significant at 1 per cent level*

The yield gain due to improved varieties over check mean yield was highest in NEPZ (31.05 %) followed by NHZ (23.31 %), CZ (19.55 %) and NWPZ (09.57 %). Therefore, efforts should be made to increase barley yield in the NEPZ and CZ by promoting recent barley production technologies in collaboration with the state department of agriculture.

The yield gain under barley FLD was highest at Kanpur (48.51%) centre followed by Mirzapur (35.58%), Panna (32.58%), Rewa (27.90%), Bajaura (25.72%), Vidisha (23.82%), Tikamgarh (20.95%), Shimla (20.51%) and Chomu Jaipur (17.79%) centers across the zones. The increase in yield due to improved varieties over check varieties at Hisar center was the lowest (05.06%).

Centre wise performance of improved barley varieties during *rabi* 2019-20

Zone and Centre	BFLDs yield (q/ha)	Check yield (q/ha)	Gain (%)
NHZ			
Bajaura	28.35	22.55	25.72 NS
Shimla	23.50	19.50	20.51**
NEPZ			
Ayodhya	32.03	29.58	08.28***
Mirzapur	52.88	39.00	35.58***
Kanpur	42.40	28.55	48.51***
NWPZ			
Ludhiana	48.38	45.00	07.50 NS
Mansa	41.70	36.70	13.62***
Hisar	52.98	50.43	05.06*
Rewari	48.75	45.25	07.73***
Bhiwani	43.60	41.40	05.31*
Durgapura, Jaipur	65.15	61.25	06.37***
Chomu, Jaipur	56.28	47.78	17.79***
Karauli	62.90	54.43	15.57***
CZ			
Udaipur	45.18	41.50	08.86***
Rajasmand	39.95	34.55	15.63***
Rewa	31.18	24.38	27.90***
Panna	26.25	19.80	32.58***
Tikamgarh	31.18	25.78	20.95***
Rajgarh	42.50	36.75	15.65**
Vidisha	50.55	40.83	23.82***

*** -Significant at 1 percent level, ** - Significant at 5 percent level, ** - Significant at 10 percent level, NS– Non-Significant

Variety wise performance of improved barley varieties during *rabi* 2019-20

Zone and Centre	Improved variety	Average yield (q/ha)	Check variety	Average yield (q/ha)	Yield gain over check (%)
NHZ					
Bajaura	HBL 713	26.13	HBL 316	20.38	28.21 NS
Bajaura	BHS 400	30.58	HBL 316	24.73	23.66 NS
Shimla	BHS 380	23.50	Local	19.50	20.51**
NEPZ					
Ayodhya	RD 2907	31.83	NDB 1	29.38	08.34***
Ayodhya	RD 2907	33.13	NDB 2	30.63	08.16 NS
Mirzapur	RD 2907	52.88	K 125	39.00	35.59***
Kanpur	RD 2907	42.50	K 508	28.75	47.83***
Kanpur	RD 2907	42.30	K 560	28.33	49.31***
NWPZ					
Ludhiana	RD 2907	48.38	PL 807	45.00	07.51 NS
Mansa	RD 2907	41.70	PL 807	36.70	13.62***
Hisar	RD 2907	52.98	BH 393	50.43	05.06*
Rewari	RD 2907	48.75	BH 393	45.25	07.73***
Bhiwani	RD 2907	43.60	BH 393	41.40	05.31**
Durgapura Jaipur	RD 2907	65.15	RD 2052	61.25	06.37***

Zone and Centre	Improved variety	Average yield (q/ha)	Check variety	Average yield (q/ha)	Yield gain over check (%)
Chomu Jaipur	RD 2907	56.28	RD 2035	47.78	17.79***
Karauli	RD 2907	62.90	RD 2035	54.43	15.56***
CZ					
Udaipur	RD 2899	45.18	RD 2552	41.50	08.87***
Rajasmand	RD 2899	39.95	Local	34.55	15.63***
Rewa	RD 2899	31.18	JB 58	24.38	27.89***
Panna	RD 2899	26.25	JB 58	19.80	32.58***
Tikamgarh	RD 2899	31.18	JB 58	25.78	20.95***
Rajgarh	RD 2899	42.50	Local	36.75	15.65**
Vidisha	RD 2899	50.55	Local	40.83	23.81***

***-Significant at 1 percent level, ** - Significant at 5 percent level, * Significant at 10 percent level, NS– Non-significant

In NHZ, BHS 400 was the highest average yielding (30.58 q/ha) variety at Bajaura centre. In NEPZ, RD 2907 at Mirzapur (52.88 q/ha), RD 2907 at Durgapura (65.15 q/ha) in NWPZ and RD 2899 at Vidisha (50.55 q/ha) in CZ were the highest average yielding varieties.

Yield potential of barley varieties in different zones during *rabi* 2019-20

Zone	Centre	Variety	Yield (q/ha)
NHZ	Bajaura	BHS 400	30.58
NEPZ	Mirzapur	RD 2907	56.68
NWPZ	Durgapura Jaipur	RD 2907	67.50
CZ	Vidisha	RD 2899	52.00

The variety wise comparison indicates that varieties BHS 400 (30.58 q/ha), RD 2907 (56.68 q/ha), RD 2907 (67.50 q/ha) and RD 2899 (52.00 q/ha) performed better than check varieties at Bajaura (NHZ), Mirzapur (NEPZ), Durgapura Jaipur (NWPZ) and Vidisha (CZ) centres respectively.

Barley varieties grown in different zones during *rabi* 2019-20

Zone	Improved varieties	Check varieties	Popular varieties in the region
NHZ	HBL 713, BHS 400, BHS 380	HBL 316, Local	Sonu, Dolma, HBL 276, HBL 316, Local
NEPZ	RD 2907	NDB 1, NDB 2, K 125 (Azad), K 508, K 560	K 125, K 409, K 508, K 551, K 560, K 1149, RD 2794, Jagriti, Manjula, NB-1, NB-2, NB-3
NWPZ	RD 2907	PL 807, BH 393, RD 2035, RD 2052	PL 807, BH 393, BH 902, BH 946, RD 2035, RD 2052, RD 2660, RD 2715, RD 2786, RD 2794
CZ	RD 2899	JB 58, RD 2552, Local	RD 2035, RD 2552, RD 2715, RD 2660, RD 2786, JB 1, JB 58, Local

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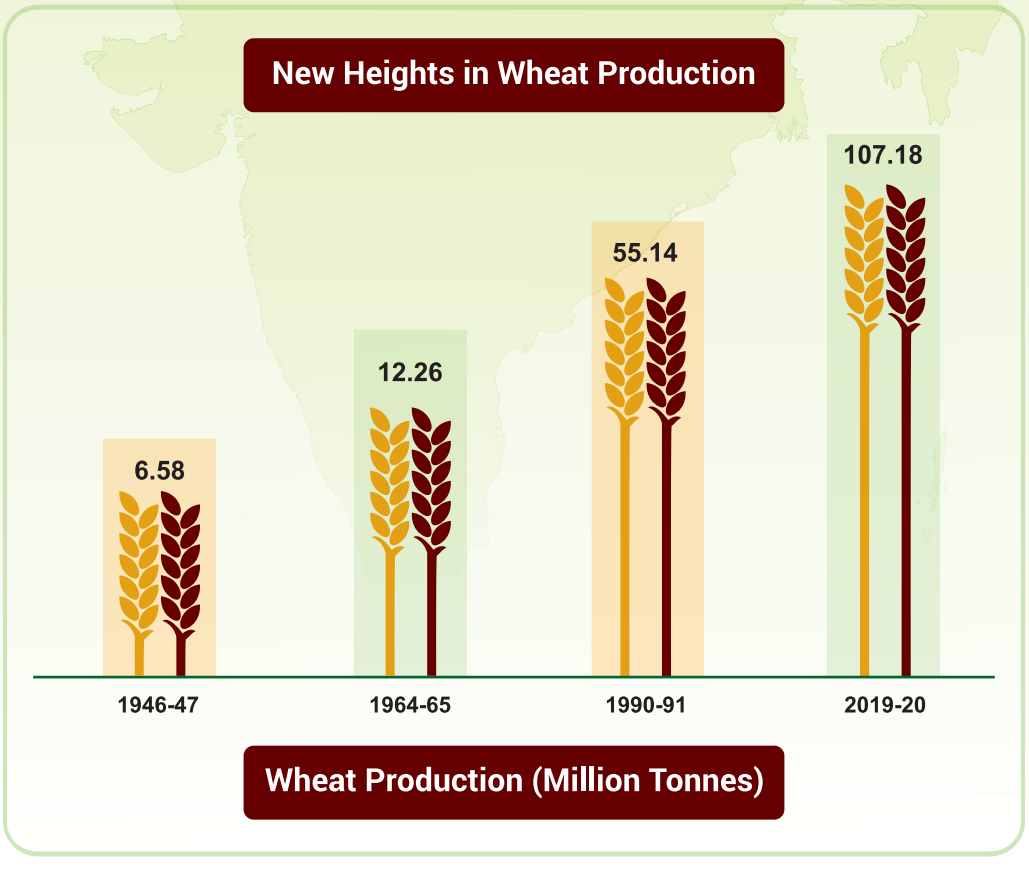

59th All India Wheat & Barley Research Workers' Meet
(August 24-25, 2020)

59वीं अखिल भारतीय गेहूँ एवं जौ अनुसंधान कार्यशाला में आयोजित गोष्ठी के दौरान जारी किया गया